Food Advertising to Children on UK Television in 2012:

Implications for Dental Health

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Degree of Doctor of Dental Science (Orthodontics)

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2.0 ACKNOWLEDGEMENTS

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3.0 ABSTRACT

***Background*:** British children are exposed to higher levels of unhealthy than healthy food advertising through the television programmes they watch (Boyland et al., 2011). Needless to say, television is one of the most powerful media through which products can be promoted (Coon et al., 2001). Cairns et al. (2013), in their systematic review, found that television food advertisements can have a direct effect on children's dietary choices, behaviours and attitudes. Furthermore, evidence shows that children who spend more time watching television are at a greater risk of developing caries (Locker, 2000). Show and Smith (1999) found an increase in the frequency of consumption of unhealthy food and beverages which could be damaging to children's dental health. Cairns et al. (2013) found food advertisements to be a significant and independent determinant of children's food behaviours. Therefore, it is crucial to explore to what extent foods that are potentially harmful to dental health are being promoted on UK television.

***Aim*:** To examine the prevalence of advertising of food and beverages on UK television watched by children, with a specific focus on foods that are potentially detrimental to dental health.

Materials and Methods:

Television sampling: Data were collected from 352 hours of television recorded from the main commercial UK channel, ITV 1, between January and December 2012. One weekday and one weekend day every month (both from 6am-10pm, i.e. 16 hours each) were recorded. Of the targeted 384 recorded hours, 32 hours were missing due to recording errors.

Coding: Recorded television hours were scanned and both food and non-food adverts were coded according to a coding scheme previously used in Boyland et al. (2011), Kelly et al. (2010) and Gantz et al. (2007), which included the type of programme in which the advertisement was shown, and peak and non-peak children's viewing times. Food adverts were classified, based on their effect on general health, into core/healthy, non-care/unhealthy, miscellaneous foods. They were further classified based on their effect on dental health into foods that are potentially harmful (cariogenic and acidogenic food products) and not harmful to dental health.

Results: 9151 adverts were coded. Food products were the second most commonly advertised products, which accounted for 16.7% of all adverts (n= 1532). Adverts for foods that are potentially harmful to dental health comprised nearly two-thirds of all food adverts (61%; n= 934) and of these, 96.6% were cariogenic foods. Adverts for cariogenic foods with high and very high sugar levels (> 9 g/100g or 100ml) represented 44.7% of all cariogenic food adverts. Of the advertised food products with very high sugar levels, sticky foods (50%) were the most frequently advertised products. Soft drinks were the most commonly advertised acidogenic foods/drinks, representing 52.4% of all acidogenic foods/drinks advertised. During peak children's viewing hours, foods that are potentially harmful to dental health comprised nearly two-thirds (65.9%) of all food advertisements shown, which was significantly higher than the proportion of adverts for foods non-harmful to dental health (34.1%) ($p = 0.011$). Although the proportion of adverts for foods potentially harmful to dental health was less than 1% during children's programmes, those adverts were shown significantly more often during other

programmes watched by children and young people, such as entertainment (25.9 %) and game shows (16.8 %)($p < 0.001$).

Conclusion: Children are exposed to a considerably high proportion of advertisements for foods that are potentially detrimental to their dental health during children's peak viewing hours and also around programmes watched by young people. The direct effect of television food advertisements on children's dietary choices (Cairns et al., 2013) and the increase in the risk of caries associated with an increase in time spent watching television (Locker, 2000) suggest the need to apply stronger regulations that help reduce children's exposure to unhealthy food advertisements.

4.0 LITERATURE REVIEW

4.1 Introduction

British children are exposed to higher levels of unhealthy than healthy food advertising through the television programmes they watch (Boyland et al., 2011). An advertisement can be defined as "a public announcement by a company in a newspaper, on television or radio, or over the Internet, intended to attract buyers for a product or service" (Business and Management Dictionary, p. 233). There are three main objectives of advertisements, namely: communicating so as to increase awareness of a company, product or service; informing about the benefits of a product or service; and, finally, persuading someone to switch brands (Bloomsbury Business Library - Actionlists and Checklists, 2007). Television is one of the most powerful media through which products can be promoted (Coon et al., 2001). Previous studies have found that television food advertisements can have a direct effect on children's dietary choices, behaviour and attitudes (Cairns et al., 2013; Coon et al., 2001). In fact, this direct influence on children's dietary habits manifests itself in a number of ways, including weight gain (Lobstein and Dibb, 2005) and poor dental health (Locker, 2000). Evidence shows that children who spend more time watching television are at greater risk of developing caries (Locker, 2000). Studies have found that the prevalence of caries is higher among children from low socio-economic families, since these children spend more time watching television than those from higher socio-economic backgrounds (Locker, 2000; Dibsdall et al., 2003; Ofcom, 2004). Dental caries is considered a significant public health problem in the UK (Pitts et al., 2007) and worldwide

(Morgan et al., 2009), and are strongly linked to an increase in the consumption of food with high sugar levels (Duggal and Van Loveren, 2001). There has also been an increase in the prevalence of dental erosion, which manifests itself as tooth surface loss among UK children and adolescents (Chadwick and Pendry, 2004). Moynihan (2002) found an association between dental erosion in children/adolescents and a high intake of acidic soft drinks, fruit juices, diet drinks, sport drinks and alcopops. Therefore, a possible connection between a growing prevalence of dental erosion and a rise in the consumption of an erosive diet should not be ignored, nor should the potential role for television food advertising in this relationship go unrecognised. The British Soft Drinks Association (2007) found an increased trend in the consumption of soft drinks among children and adolescents in the UK between 1986 and 2006. Moreover, Show and Smith (1999) have found an increase in the frequency of consumption of unhealthy foods and beverages, which could be damaging to dental health. Other studies conducted by Milgrom and Reisine (2000) and by Marshall et al. (2005) have also indicated a significant association between unhealthy snacking and development of caries among children. In 2006, 40% of all 5-year-old children in the UK were found to have dental health problems (Pitts et al., 2007). In fact, oral health problems are considered significant issues, because they not only have a negative impact on children's dental health (e.g. tooth loss) (Tickle et al., 2008) but also, consequences, which may include dental pain (Tickle et al., 2008), dental anxiety (Kanaffa-Kilijanska et al., 2014) and missed school days (Casamassimo et al., 2009), can extend to affect their psychosocial well-being. Moreover, the effects of such problems can go beyond

affecting individuals to affecting families (e.g. through stress) and health care resources used to provide treatment (Casamassimo et al., 2009).

4.2 Food advertisements on UK television

4.2.1 The extent and nature of food advertisements on UK television

Many food and drink products being promoted on television are potentially harmful to children's dental health (Rodd and Patel, 2005; Ghimire and Rao, 2013). Cairns et al. (2013) found that the most heavily advertised food products were pre-sugared breakfast cereals, soft drinks, savoury snacks, confectionary and fast foods. They also found that the food market was targeting children more than adults. Chestnutt and Ashraf (2002) found that the number of food advertisements was higher during children's programmes (63%) compared to prime-time programmes (18%). According to Boyland et al. (2011), foods were the third most advertised product category in 2008. Across the sample (a total of over 5000 hours of television popular with children), Analysis was made on advertisements for foods classified based on their effect on general health into core/healthy, non-core/unhealthy, and miscellaneous foods. The results showed that the number of the non-core foods advertisements were significantly higher than those for miscellaneous or core foods. It was also found that fruit and vegetable advertisements only made up 1.4% of all food advertisements (Boyland et al., 2011). Kelly et al. (2010) conducted a global study in Australia, Asia, Western Europe, North and South America to evaluate the extent and nature of television food advertising to children. They found that food represented the second most commonly advertised product, comprising 18% of all adverts. Of

these food adverts, 67% were for non-core foods. The most heavily advertised food products were fast-food restaurant meals, chocolate and confectionary, low-fat dairy products, high fat, high-sugar, high-salt spreads and sauces, and full fat dairy products. It was also noticed that the proportion of advertisements for non-core foods during programmes aimed at children was high (Kelly et al., 2010). In another study, Rodd and Patel (2005) analysed almost 1,000 adverts shown over forty-one hours of children's television programmes on ITV1, which is considered the UK's main commercial channel. The researchers found that 24 adverts were shown per broadcast hour, and they also found that the food and drink adverts accounted for 34.8% of all adverts, of which 95.3% of the foods featured were potentially damaging to dental health as they contain high levels of sugar and/or acid (Rodd and Patel, 2005). Morgan et al. (2009) found that adverts for food products made up 16.4% of all advertising, and 6.3% of these were for potentially cariogenic products. The most heavily advertised high sugar products were sugared cereals, followed by sweetened dairy products and confectionary (Morgan et al., 2009). Another study was conducted by Sixsmith and Furnham (2010) to analyse British food advertisements aimed at children on the channel, ITV 1, in 2008. Their results showed that the proportion of advertising for unhealthy food products aimed at children (77.1%) was significantly higher than for healthy food products (22.9%).

4.2.2 Variations in advertisements during the day and across the year

Several previous studies have suggested the presence of significant variations in the food advertising pattern across the day and year. Kelly et al. (2010) found that unhealthy foods and beverages were advertised more often during children's peak viewing hours, when more than a quarter of the potential children audience was likely to be watching, compared to non-peak children's viewing hours. A study carried out by Boyland et al. (2011) also showed that the proportion of food advertisements was significantly higher during children's peak viewing hours. In addition, this study demonstrated that, when food advertisements across the year were analysed, a noticeable rise was seen in the proportion of miscellaneous foods advertisements from July onwards, particularly in supermarket advertising of non-core foods, which was found to be significantly higher during August and September (Boyland et al., 2011). Another study by Morgan et al. (2008) found an increase in high sugar food advertisements in the week before Christmas.

4.2.3 Variations in food advertising patterns around various programme types

Differences in the extent of food advertising in and around various programmes have been investigated in previous studies. Boyland et al. (2011) found that the proportion of food advertisements was significantly greater around soap operas (25.4%) and entertainment programmes (19.7%) than children's programmes, which represented only 4.5% ($P < 0.001$). In another study conducted by Kelly et al. (2010), the proportion of advertisements for non-core

foods was the highest around programmes aimed at children, which accounted for 80% of food advertisements.

4.2.4 The influence of food marketing on children

Cairns et al. (2013) found in their 2009 systematic review that television food advertisements have various considerable effects on children. They found that food promotion can draw children's attention, and not only make them accept the promoted product, but it can also make them like it and even make demands for it to their parents. Furthermore, the exposure to food marketing can influence food consumption behaviours. For example, it can increase the frequency of snacking, raise the consumption of foods that are high in calories, and lessen their choice of healthy foods. Moreover, the brand (e.g. McDonald's) can influence food choices and preferences (Boyland and Halford, 2013; Cairns et al., 2013). In addition, Gantz et al. (2007) found that directing people to a website by including the web address in the advert may persuade them or influence their choices. Although Ofcom (2004) stated that television food promotion is only one factor among many other factors (e.g. social and environmental factors) that can affect children's dietary choices, Cairns et al. (2013) found that food advertisements can play a significant and independent role in influencing food behaviours and ultimately health status.

4.2.5 United Kingdom's regulations on food advertisements

Concerns over health problems, such as increases in the prevalence of childhood obesity and ill-health due to poor food selection behaviours that are strongly linked to food advertising, led the Office of Communications (Ofcom, the UK broadcast media regulator) to introduce new regulations for television advertising of food and drink products to children in three phases, hoping thereby to reduce children's exposure to such advertisements. In April 2007, phase one was implemented, which involved a total ban on food products that are high in fat, salt, or sugar (HFSS) in or around programmes of particular appeal to children aged 4-9 years. These programmes are determined by the proportion of children in the viewing audience, which should be at least 20% more than the proportion of children in the general population. Phase two began in January 2008, involving an extension of the ban to programmes that are likely to be directed at children aged 4-15 years. In January 2009, phase three was introduced and involved an additional total ban on HFSS products in and around all programmes on dedicated children's channels. Moreover, the use of celebrities and licensed characters, promotional offers and health claims were banned in all HFSS food/drink advertisements that target children at primary school level or younger, in an attempt to lessen children's emotional engagement with the advertised products (Ofcom, 2008). Statistics showed that there was a reduction of about a third in HFSS advertising products to children aged 4-15 years old in 2007/8 compared to 2005 (Ofcom, 2008). It has been suggested that the regulations were moderately effective in reducing children's exposure to HFSS advertising during children's programming on dedicated children's channels, but that they were less successful in relation to the other programmes,

e.g. family viewing (Boyland et al., 2011). A 2009 systematic review of evidence on food advertisements aimed at children confirmed the persistence of the issue as foods with low nutrition are still being promoted, influencing children's food behaviours with only little progress in achieving the policy aims of reducing children's exposure to advertised HFSS foods (Cairns et al., 2013).

The effectiveness of the total restriction on HFSS food advertising to children on UK television and its impact on reducing children's exposure to such adverts have solicited concerns among many researchers in the UK. Adams et al. (2008) looked at the proportion of food advertisements for less healthy products in and around programmes of particular appeal to children on three terrestrial commercial channels in the UK and four popular channels in Canada during one week in 2006 before the implementation of phase three of the Ofcom regulations. They found that around 5% of food advertisements would have been banned under the last phase of UK Ofcom regulations (Adams et al., 2009). Adams et al. (2012) conducted another cross-sectional study of all advertisements promoted over a one-week period in the UK in July 2009 after the full implementation of Ofcom food advertisement regulations, then compared the results from this study with the first one undertaken in October 2006. This was to assess the actual impact of the final phase regulation on relative exposure to HFSS food advertising among children and all viewers. In the two cross-sectional studies, more than one million advertisements over 288 channels were included. It was found that, in spite of the fact that a good adherence to the restrictions was achieved, not only did children's relative

exposure to HFSS advertising not change but all viewers' relative exposure to HFSS advertising actually increased (Adams et al., 2012).

Clearly, the extent of food advertising aimed at children on UK television and the effectiveness of the restrictions on HFSS food advertising in reducing children's exposure to such adverts have been investigated in previous studies (Boyland et al., 2011; Kelly et al., 2010; Sixsmith and Furnham, 2010; Adams et al., 2008). The effectiveness of the final phase of food advertising regulations was evaluated by Adams et al. (2012) soon after the implementation of the regulations, which helped in evaluating only the short term effects of the restriction, but not the long term effects. In the present study, we were able to demonstrate the long term effects of the final phase of the restriction of HFSS food advertising aimed at children on UK television.

The extent of advertising of foods potentially harmful to dental health after the implementation of the final phase of food advertising regulations is not yet known. All the previous studies that were conducted to investigate the extent of advertising of foods potentially detrimental to oral health were carried out before the full implementation of Ofcom's food advertising regulations (Morgan et al., 2008; Rodd and Patel, 2005; Chestnutt and Ashraf, 2002), but no study has been conducted since then. Therefore, the current study aims to examine the overall extent of advertising of foods and beverages that are potentially harmful to dental health after the final phase of food advertising regulations.

Like most previous studies on food advertising aimed at children in the UK, television hours were recorded from ITV 1, because it accounts for 99% of the commercial programmes shown

on ITV channels, which is considered the biggest commercial television network in the UK (ITV website, 2008). According to the ITV website (2008), ITV 1 is watched by more than five million people.

4.3 Dental caries

4.3.1 Definition and causes

Dental caries is defined as a chronic infectious disease caused by bacteria that metabolize dietary carbohydrate to reduce the pH, leading to demineralization in the tooth structure (Azevedo, Bezerra and Toledo, 2005; Seow et al., 2009). This occurs due to the presence of high quantities of sugar which enable the micro-organisms in the dental plaque to form organic acids. The pH in the dental plaque then drops to between 5.0 and 5.7, leading to demineralization of the tooth structure, which involves the loss of the phosphate and calcium ions from the hydroxyapatite crystals of the enamel surface. Early lesions are manifested clinically as white spots, where the loss of those ions are greater in the subsurface but the enamel surface remains intact. Further progression of the lesion will result in breakdown of the surface and cavity formation (Cairns et al., 2002; Chestnutt and Gibson, 2007). According to the "non-specific plaque hypothesis", caries is not caused by the action of a single bacterial species; actually, it results from the acid produced by a group of organisms. Mutans streptococci and Lactobacilli are the most important organisms that cause dental caries in the presence of a cariogenic diet. Streptococcus mutans and Streptococcus sobrinus are Gram-positive cocci that

belong to the Mutans streptococci group. These types of bacteria play a major role in the initiation of caries due to their acidogenic and aciduric effects by being able to produce acid and survive at low pH to metabolize sugars (Moynihan, 2002). Lactobacillus species are Gram-positive bacilli, which are considered aciduric because of their ability to survive in an acidic environment (Chestnutt and Gibson, 2007).

4.3.2 Prevalence

Dental caries is considered a major public health problem in many parts of the world (Petersen, 2003). In the UK, the epidemiological statistics show that an average of 43% of five-year-olds children have decayed teeth (Pitts and Harker, 2004). Levine and Stillman-Lowe (2004) found a high prevalence of dental caries among people of low socio-economic status. Furthermore, reports of cross-sectional surveys of the caries experience of five year old children in the United Kingdom in 2011/2012 showed that the prevalence of caries continued to be higher in the most deprived areas in England and Wales despite the overall decline in decay levels among young children (Monaghan et al., 2014). Researchers related the cause of dental caries to an increase in the amount and frequency of sugar intake (Levine and Stillman-Lowe, 2004).

4.3.3 Cariogenic foods

In fact, foods and beverages with increased levels of sugar can lead to tooth decay due to their cariogenic effect. The cariogenic effect is defined as the ability of nutritious components in foods or drinks to cause dental caries (Chestnutt and Gibson, 2007).

There are several factors influencing the cariogenicity of foods. The frequency and amount of sugar intake are closely correlated and associated with the development of dental caries. Frequent consumption of a diet with high sugar levels results in exposing the tooth surface to a prolonged period of reduced plaque pH below the critical level (which is between 5.0 and 5.7), leading to demineralization and loss of calcium and phosphate ions from the tooth structure. In addition, the consistency of foods can influence their cariogenic effect due to the variable residence time of sugars in the mouth. Sticky retentive foods, like toffee, are more cariogenic than liquid or non-retentive forms, such as chocolate (Chestnutt and Gibson, 2007; Watt, McGlone and Kay, 2003; Rodriques and Sheiham, 2000).

4.3.4 Different food classification systems

Standard classification of sugars

In 1989, the Department of Health Committee on Medical Aspects of Food Policy (COMA) in the UK made a standard classification of sugars for dental health purposes. Sugars are classified as intrinsic or extrinsic, based on their location within the food or drink cellular structure. Sugars found to form an integral part of some unprocessed food stuffs inside the cellular structure are

considered intrinsic sugars. This type of sugar can be found in whole fruits and vegetables, which mainly contain fructose, glucose, and sucrose. In contrast, extrinsic sugars are found outside the cellular structure of foods and drinks in a free or added form. Extrinsic sugars are further classified into milk extrinsic sugars or non-milk extrinsic sugars (NMES). Milk extrinsic sugars include mainly lactose and can be found in milk and products containing milk. Non-milk extrinsic sugars include sucrose, fructose and glucose, and this type can be found in table sugar, confectionery, soft drinks, biscuits, cakes, honey and fresh fruit juices (Moynihan, 2002). A study by Moynihan (2005) and another by Watt, McGlone and Kay (2003) found that biscuits and cakes were the main sources of NMES. Another study showed that soft drinks and confectionary were the main sources of NMES among young people (Gregory et al., 2000). In fact, intrinsic sugars have low cariogenicity, whereas extrinsic sugars are considered more cariogenic, because they are in a free form and therefore readily available to be metabolised by oral bacteria (Department of Health, 1991). However, not all extrinsic sugars have high cariogenic potentials. For instance, lactose has low cariogenicity, such that milk is considered cariostatic in nature (The Dairy Council, 2001; Reynolds and Johnson, 1981). Compared with intrinsic and milk extrinsic sugars, NMES are highly cariogenic and can cause damage to dental health. The dietary reference value (DRV) for NMES should not exceed 60 grams for each person per day, and not more than 10% of the total energy intake per day (Chestnutt and Gibson, 2007; Department of Health, 1991; Department of Health, 1989).

The Nizel and Papas classification

Foods with high levels of sugar can be classified based on the Nizel and Papas classification of sweet scoring as liquid, slowly dissolving, solid and sticky foods (Nizel and Papas, 1989). Examples of liquids with high levels of sugars include soft drinks, ice cream, fruit drinks, sugar and honey in beverages, non-dairy creamers, flavoured yogurt, custards, etc. Solid and sticky foods that form the second category of sugar-rich foods include cakes, donuts, pastry, canned fruit in syrup, cookies, raisins, caramel, chocolate candy, toffee, banana, chewing gums, etc. The last category includes slowly dissolving foods, e.g. hard candies, breath mints and cough drops. Because sticky foods stay for a longer period of time on the teeth, they are considered to have high cariogenic potential. Moreover, hard slowly dissolving sugar-rich foods have high cariogenic levels due to the prolonged exposure of teeth to the sugar (Nizel and Papas, 1989; Johansson et al., 2004).

Traffic light signposting scheme

The British Food Standards Agency (FSA) has recently developed a new system for nutrition labelling called the traffic light signposting scheme. It is a coding system that uses colours to indicate the proper or improper amount for four nutrients, namely: fat, saturated fat, sugar, and sodium (Appendix 1). With regard to sugar levels (g/100g or 100ml), 1.8 is considered low, 9.0 is medium, and 32.6 indicates a high level of sugar. The three colours used in this system to indicate the content level are red (high in content), amber (medium content) and green (low in content) (Hieke and Wilczynski, 2012; Food Standards Agency). Those colours were chosen based on their psychological and emotional effect on individuals. It was found that people

perceive the green colour to be positive and usually associate it with the following adjectives: peaceful, calm and gentle. In contrast, the red colour conveys negative unfavourable signals; words such as hot, emotional and sharp are frequently associated with this colour (Madden, Hewett and Roth, 2000). A study carried out by Hieke and Wilczynski (2012) showed that the traffic light food labels are an effective method for providing nutritional information in a simple and easy way that can effectively help the general public with decision making.

4.3.5 Food and caries risk

Starchy staple foods:

Raw starch and cooked or refined starch show different levels of cariogenicity. Raw starch, which can be found in raw vegetables, has a low cariogenic level. In contrast, food containing cooked or highly refined starch is potentially cariogenic (Mundorff-Shrestha et al., 1994). According to some animal experiments, the combination of cooked starch and sucrose, as in biscuits, cakes, and sugared breakfast cereals, may result in more caries compared to sucrose alone (Firestone, Schmid and Muhlemann, 1982).

Fruit and fruit sugars:

Fresh fruit has a lower level of cariogenicity compared to fresh unsweetened fruit juice or dried fruit. Although fruit contains sugars (fructose, sucrose and glucose), it still has low cariogenic potential as stated in the COMA report “Dietary Sugars and Human Disease” (Pollard, 1995). On the other hand, fresh unsweetened fruit juice is considered potentially cariogenic, because the

juicing process releases the intrinsic sugars outside the cellular structure, converting them into non-milk extrinsic sugars (Birkhed, 1984). Similarly, the drying process for fresh fruit increases the dried fruit's cariogenicity due to the alteration that occurs in the cellular structure which releases fructose, sucrose and glucose. In fact, dried fruit is considered potentially cariogenic, not only due to the drying process but also because it is sticky and can be retained on the teeth for a longer period of time (Moynihan, 2002).

Milk sugars:

Lactose is the type of sugar present in milk. Because this type of sugar has the least cariogenic level among all other monosaccharides and disaccharides, milk is considered non-cariogenic (The Dairy Council, 2001). Some minerals in milk, such as calcium phosphate and casein, can help to protect teeth against demineralization (Reynolds and Johnson, 1981). Moreover, evidence suggests that milk can be anti-cariogenic; and as such, it can protect teeth from caries. An experiment performed on rats after removing their salivary glands showed that the consumption of milk did not cause dental decay (Bowen et al., 1991). Similarly, cheese and yoghurt have anti-cariogenic potentials and can protect teeth from caries. However, adding sugar to milk products makes them cariogenic (Gregory, Lowe and Bates, 2000).

Hidden sugars:

Oligosaccharides can be found in some sugar-free products such as fructo-oligosaccharides, maltodextrins anti-caking agents in dried packet foods or glucose syrup. This type of sugar is considered potentially cariogenic, but the problem with oligosaccharides is that they are

excluded from the total sugar information provided in nutrition labels, which include only monosaccharides and disaccharides (Moynihan et al., 1996).

Non-sugar bulk and intense sweeteners:

These are considered non-cariogenic. Intense sweeteners include: saccharin, aspartame (NutraSweet, Canderel), acesulfame K (Sunett), and thaumatin. Non-cariogenic bulk sweeteners are sorbitol, mannitol, xylitol, maltitol, lactitol, isomalt (palatinit), and hydrogenated glucose syrup (lycasin). In fact, xylitol is not only a non-cariogenic bulk sweetener, but also has an anti-cariogenic effect (Makinen et al., 1996). Xylitol helps in the prevention of caries by acting on the plaque, saliva and tooth surface. It helps reduce the plaque quantity and increase the concentration of amino acids and ammonia that help in neutralizing the plaque acids. Moreover, it cannot be fermented by plaque organisms, and can also help in reducing the amount, transmission and virulence of mutans streptococci. In addition, it can play a vital role in dental enamel remineralization by increasing the secretion of saliva, rich in calcium and phosphate (Maguire and Rugg-Gunn, 2003).

4.3.6 Dietary advice for the prevention and management of dental caries

It is recommended that the amount and frequency of sugar attacks should be reduced. Moreover, consumption of sugar-containing foods and drinks should be limited to mealtimes, if possible. A reduction or elimination of sugar from one's diet can lead to a reduction in dental caries (Silverstein et al., 1983). According to the Committee on Medical Aspects of Food and Nutrition Policy (COMA), the amount of non-milk extrinsic sugar consumed in the diet should

not be more than 10% of the total food energy intake (Watt, McGlone and Kay, 2003). If snacking between meals cannot be avoided, then it is advisable to consume a diet with low potential for dental caries or with anti-cariogenic effects. Johansson et al. (2010) found a significant increase in the prevalence of dental caries among children who eat chips, candies, cookies and ice cream for most of the day, whereas those who frequently consumed fresh fruits, crackers and yogurt did not develop caries. Studies have also proven that for good oral health, it is important to limit the frequency of sugar intake to not more than four times a day, including sugar taken at meal times. In addition, because the salivary flow rate is reduced at night, thereby reducing its buffering capacity, it is recommended that consumption of high sugar-containing foods and drinks within one hour before bedtime should be avoided (Levine and Stillman-Lowe, 2004; Watt, McGlone and Key, 2003; Moynihan, 2005).

It is also recommended that foods and drinks that have low or no risk of caries are the ones to be consumed; these include: bread, pasta, rice, starchy staple foods, unsweetened or artificially sweetened yogurt, low-sugar breakfast cereals, sugar-free confectionary, fresh fruit, sugar-free drinks and water. Moreover, people are advised to consume a diet with an anti-cariogenic effect, especially after meals, to help neutralize the acidity of dietary sugars. Therefore, they may be encouraged to drink unsweetened tea or milk, eat cheese, peanuts, or chew sugar-free or xylitol sweetener gum (Moynihan, 2002).

4.4 Dental erosion

4.4.1 Definition and causes

Dental erosion is defined as a progressive and irreversible loss of tooth structure due to a chemical process that does not involve bacteria (Reynolds et al., 1999). It is caused by either intrinsic acid or extrinsic acid, or a combination of both. Intrinsic causes include acid regurgitation, which can be seen in patients suffering from bulimia nervosa, gastrointestinal problems, gastro oesophageal reflux and morning sickness. Extrinsic causes can result from frequent consumption of an acidic diet, such as carbonated drinks, fruit juices, citrus fruits and pickled foods. It might also be caused by certain kinds of acidic medication, for example, effervescent vitamin C or aspirin. In addition, the exposure to and breathing in of acids and chemicals during work can also lead to extrinsic dental erosion (Wang and Lussi, 2010; Chestnutt and Gibson, 2007). The chemical process involved in erosion starts with softening and demineralization of the enamel surface. When acids are diffused into the tooth, calcium and phosphate ions are released from the outer tooth structure. According to Voronets and Lussi (2010), the thickness of this softened layer was found to be between 0.2 and 3 µm. Later, destruction in the appetite crystals of the dentition occurs, which leads to irreversible loss of tooth structure and dental wear, and might extend deeper into the underlying surfaces in advanced severe erosive lesions (Wang and Lussi, 2010).

4.4.2 Prevalence

Studies have shown a steady rise in the prevalence of erosion among young adults, adolescents and young children in recent years (Holbrook, Arnadottit and Kay, 2003). According to epidemiological studies, there is a significant increase in the prevalence of dental erosion in

both primary and permanent dentition among children in the UK. Statistics showed a dramatic increase in the prevalence of erosion in the primary dentition of five-year-old children from 24% in 1993 (O'Brien, 1994) to 53% in 2006 (Chadwick et al., 2006). A similar pattern was observed in the permanent dentition of 12-year-olds who also showed an increase in the prevalence of dental erosion from 37% in 2000 (Deery et al., 2000) to 59.7% in 2004 (Dugmore and Rock, 2004). Dugmore and Rock (2003) carried out a study on 1308 adolescents in the UK to assess the prevalence and incidence of dental erosion among 12-year-old children, and then again two years later. It was found that approximately 12% of these adolescents had good oral health at age 12, but had developed erosive lesions when examined two years later. Furthermore, the prevalence of dental erosion had increased from 5% at baseline to more than 13% of the subjects, with deep erosive lesions after two years. This growing prevalence of dental erosion, especially among children, adolescents and young adults, has been strongly linked to a high intake of an acidic diet (Dugmore and Rock, 2003).

4.4.3 Acidogenic foods

High levels of acid in foods and drinks can result in erosion and tooth destruction due to their acidogenic effect. The acidogenic effect is defined as the ability of oral acids to cause erosion on the dentition surface and loss of tooth enamel because of their low pH value (Cairns et al., 2002). Erosion, which is a progressive loss of hard dental tissues due to chemical factors, occurs when the pH is less than 4.5 (Chestnutt and Gibson, 2007). A study carried out by Tahmassebi

et al. (2006) showed that a significant change has taken place in people's habits in terms of the consumption of soft drinks and refreshing beverages. Evidence has suggested that the increase in erosion is due to the high consumption of soft drinks, including both fruit juice and carbonated drinks (Deery et al., 2000). Another study was carried out by Nahas et al. (2011) to assess the associated factors of dental erosion among 2-20 year olds. It was found that there is a significant association between erosion and frequent consumption of soft drinks and acidic candy due to the demineralization effect and chelating action of dietary acids on the enamel calcium. On the other hand, it was also noticed that milk contains remineralization proteins such as casein, which can protect teeth from dental erosion (Nahas et al., 2011). Under the influence of acidogenic foods and drinks, the composition and structure of the hydroxyapatite can be changed. Nikolic, Kalicanin and Krstic (2012) carried out a study to assess the negative effects associated with the consumption of acidogenic foods and beverages in terms of the alteration of ions and erosion of tooth enamel. They studied the erosive effect on teeth exposed to acidic beverages, which included citric acid, lactic acid, acetic acid, apple vinegar, lemonade, the soft drink Sprite and mineral water, on an annual basis. It was found that there was a significant loss of zinc, copper and lead; however, calcium ions were below the level of detection. Moreover, it was shown that acidogenic foods and drinks can lead to a significant loss of 1-5 µm of tooth structure (Nikolic, Kalicanin and Krstic, 2011).

Evidence suggests that the most common cause of erosion is diet containing acids. Foods and drinks are considered potentially erosive if they contain any of the following acids: citric, malic, phosphoric, tartaric, acetic, carbonic acids and ascorbic acids (Moynihan, 2002; Wang and Lussi,

2010). In fact, citric acid has high erosive potentials because of its high buffering capacity and its ability to form chelating complexes with calcium ions. According to a study by Meurman and Ten Cate (1996), almost a third of the calcium concentration in saliva might be complexed by citrate. As a consequence, the calcium concentration in saliva is reduced, leading to a decrease in the buffering capacity of the saliva and thereby increasing the erosive effect of the acid in demineralizing the tooth surface (Meurman and Ten Cate, 1996). High consumption of acidic foods and beverages and prolonged exposure of the teeth to acidic media can lead to erosion. Foods and drinks that are potentially erosive include the following (Moynihan, 2002):

1. Soft drinks (carbonated and diluted squashes)
2. Fresh fruit juices and fruit juice drinks
3. Wine, alcopops, cider and perry, spirits consumed with mixers
4. Some types of herbal teas
5. Large quantities of fresh fruit (such as citrus fruit and apples, but not bananas)
6. Large quantities of vinegar, sauces and pickles
7. Acidic sweets
8. Large quantities of chewable aspirin and vitamin C tablets

4.4.4 Dietary risk factors associated with dental erosion

Dental erosion is a multifactorial condition associated with biological, chemical and behavioural risk factors. First, biological factors that might be predisposed to the development of dental erosion are saliva secretion as well as the structure and position of the teeth in relation to the

soft tissues and tongue. A good example can be seen in the maxillary and mandibular incisors of patients who have frequent intake of acidic beverages. Erosion usually occurs on the palatal surfaces of the maxillary incisors because the tongue plays a role in abrading the softened layers of enamel after an acidic drink. Mandibular incisors, however, are protected from exposure to acids by the saliva secreted from the submandibular gland (Johansson, 2002; Larsen, Poulsen and Hansen, 2005). A systematic review was carried out by Buzalaf, Hannas and Kato (2012) to study the influence of salivary factors on the development of dental erosion. The research was based on the MEDLINE website's papers that were published from 1969 to 2010. Researchers found that saliva plays a significant role in protecting teeth from erosion in various ways. First of all, saliva can help in the dilution of acids and neutralization of dietary acids due to its buffering capacity. In addition, acids can be eliminated gradually by salivary secretion. Because saliva contains calcium, phosphate and fluoride, it can play an important role in remineralizing the tooth structure. Moreover, proteins present in saliva and acquired pellicle may protect teeth from direct contact with the acids by acting as a barrier between the tooth surface and acids (Buzalaf, Hannas and Kato, 2012).

As to the chemical risk factors, properties of an acidogenic diet (including the pH value, buffering capacity and mineral content) should be considered when assessing the acidogenicity and the erosive potential of a particular diet. In fact, the pH value is considered a reliable measure for assessing the acidity or basicity of a solution. A solution is neutral when the pH value is equal to 7, acidic when it is less than 7, and alkaline if the pH value is more than 7. Moreover, the buffering capacity is another important factor that can influence the

development of erosive lesions. It is associated with undissociated acids that act as a buffer to keep the pH value constant. Therefore, if the solution has a high buffering capacity, the saliva is going to take a longer time to increase the pH value and decrease the acidity of the solution (Larsen and Nyvad, 1999; Owens, 2007). Furthermore, the mineral content plays an important role in the development of dental erosion. The concentration of calcium, phosphate and fluoride ions in the diet is important for assessing the degree of dissolution in the tooth minerals, which is based on the level of saturation of the food or drink in relation to the tooth's minerals. When the tooth comes in contact with an undersaturated acidic solution, a small amount of minerals will be lost from the tooth, which will lead to a rise in the mineral content of the solution until it becomes saturated and then stops dissolving further minerals from the tooth surface (West et al., 2003; Ramalingam, Messer and Reynolds, 2005; Panich and Poolthong, 2009).

Eating and drinking habits can have a significant impact on the development of dental erosion. The frequency and duration of dietary acid attacks are important factors that should be considered in patients with dental erosion (Lussi and Schaffner, 2000; O'Sullivan and Curzon, 2000; Johansson, Lingstrom and Birkhed, 2002). Moreover, the appearance and severity of erosive lesions might be influenced by the patient's dietary habits and the various ways of introducing dietary acids into the mouth such as sipping, sucking and drinking with or without a straw (Johansson et al., 2004).

4.4.5 Dietary recommendations for the prevention and management of dental erosion

It is recommended that the consumption of acidic diet be reduced and their consumption be confined to mealtimes if possible. People should be advised to have food and drinks such as cheese or milk that can protect their teeth and neutralize dietary acids, especially after a potentially erosive diet (Moynihan, 2002). In fact, cheese is considered anti-erosive because it can help in stimulating saliva secretion and can also raise plaque calcium concentration (Gedalia et al., 1994). It is also recommended to consume foods and drinks with low or no erosive potentials such as bread, pasta, rice, starchy staple foods, fibrous foods (e.g. vegetables), low-sugar breakfast cereals, sugar-free chocolate, sugar-free chewing gum, peanuts, unsweetened tea and coffee, water and Ribena Toothkind (Moynihan, 2002). In fact, the increased pH and the added calcium in Ribena Toothkind can help reduce tooth demineralization and dental erosion (Hughes et al., 1999 a, b; Toumba and Duggal, 1999). People should also be aware of some types of sugar-free products that have erosive potentials. Nadimi et al. (2011) found that some sugar-free products have acidic additives and preservatives, which might cause dental erosion. Moreover, it is recommended that a modified diet with minerals such as calcium, phosphate, and fluoride ions be taken, which can help reduce the erosive potential of foods and beverages. A high content of minerals in any diet can help increase saturation with respect to minerals in the tooth structure, and will ultimately retard enamel dissolution and demineralization (Wang and Lussi, 2010). A study carried out by Jensdottir et al. (2007) showed that the erosive potential of an acidic candy was significantly reduced following the addition of 15 mM of calcium.

4.5 Suggested preventive strategies

A preventive approach would involve limiting the number of advertisements that promote products which are potentially damaging to dental health, as well as making sure that they carry health-warning messages, coupled with promoting healthy food advertisements and health-related information (Ghimire and Rao, 2013; Rodd and Patel, 2005). Moreover, it is important to keep the regulatory mechanisms under continuous evaluation through systematic monitoring of food advertising. Re-evaluation of food advertising should be considered, especially after the full implementation of the relevant regulations since January 2009 (Boyland et al., 2011). Both the media and health professionals play a vital role in health promotion and prevention of dental problems by delivering the right message to children and their parents, thereby increasing awareness of dietary choices and positively changing food consumption in favour of healthy food products.

4.6 Dental Health care products

Maintaining a good level of oral hygiene is essential for the prevention of dental caries and periodontal diseases (Robinson et al., 2005; Deery et al., 2004). Mechanical plaque removal using different tooth brushing techniques and interproximal cleaning aids are effective ways of controlling plaque formation (Claydon, 2008). Yaacob et al. (2014) found in their Cochrane review that electric toothbrushes were more effective than manual tooth brushes in the management of gingivitis and plaque control. In spite of the fact that different tooth brushing techniques are effective in controlling plaque formation, they are inefficient in cleaning the

interproximal surfaces of teeth (Loe, 2000). There are several interproximal cleaning aids, which include tooth picks, dental floss, and interdental brushes. According to Ashwath et al. (2014), the use of dental floss in addition to the toothbrush had a significant effect on the removal of interproximal plaque. However, Bowen (2012) in his systematic review found that flossing was not an effective method in the management of dental caries, but the evidence proved its effectiveness as adjunct to tooth brushing in the management of gingivitis. Moreover, a systematic review carried out by Rugg-Gunn and Banoczy (2013) found that fluoride toothpastes and mouth rinses are effective in the prevention of dental caries. Another systematic review and meta-analysis showed that standard fluoride toothpastes (1000-1500 ppm) were effective in preventing dental caries in the primary dentition (Dos Santos, Nadanovsky, and de Oliveira, 2014).

Since a good level of oral hygiene plays a significant role in controlling plaque development and preventing caries and periodontal diseases (Robinson et al., 2005; Deery et al., 2004), people's awareness about such important factor should be increased and their attitude can be positively modified by using the power of the media to promote dental health care products. In fact, the extent of advertising on oral health care products on UK television has not been investigated yet. Therefore, one of the objectives of this study is to assess the extent of advertising on dental health care products on UK television.

5.0 AIM AND SECONDARY AIMS

5.1 Aim:

To look at the prevalence of advertising of foods and beverages on UK television watched by children, with a specific focus on food products that are potentially detrimental to dental health.

5.2 Secondary aims:

1. To examine the extent of advertising of different types of food including core/healthy foods, non-core/unhealthy foods, and miscellaneous foods.
2. To examine the extent of advertising of different types of cariogenic foods/drinks.
3. To examine the extent of advertising of different types of acidogenic foods/drinks.
4. To look at the overall extent of advertising of common food with possible anti-cariogenic and/or anti-erosive effects.
5. To assess the extent of advertising for dental health care products.
6. To look at variations in advertising patterns for food potentially harmful to dental health in and around various programme types.
7. To look at the variations in these food advertising patterns during the day, between weekdays and weekends, and across the year.

6.0 MATERIALS AND METHODS

6.1 Ethical approval

Ethical approval was not required for this study because it did not involve human participants.

6.2 Design

This was a retrospective study.

6.3 Method

6.3.1 Television sampling

The sample included three hundred and eighty-four (384) hours of television from the ITV channel between January and December 2012. One weekday and one weekend-day every month were recorded. Where possible national holidays, large sporting competitions, special events and low rating (i.e. holiday) periods were avoided. Weekday recordings were limited to either Tuesdays or Thursdays of each month to reduce the potential impact of variation in advertising across days of the week. For weekend-days, recordings were made on either Saturdays or Sundays. A quasi-random approach was taken in which days were alternated each month. Sixteen hours were recorded on each day, starting from 6:00 am to 10:00 pm.

To minimize bias attributable to seasonal variation, the spread of recorded days across the year was the same due to choosing a weekend day (Saturday or Sunday), and a weekday (Tuesday or Thursday) for every month in the chosen year.

6.3.1.1 Missing data

Out of the 384 recorded hours, 32 hours were missing due to recording errors. Recorded hours could not be found for 16 hours one weekday in February from 6:00 am to 10:00 pm, 8 hours another weekday in July from 10:00 am to 2:00 pm and from 6:00 pm to 10:00 pm, and 4 hours one weekend in September from 10:00 am to 2:00 pm.

6.3.2 Coding

Recorded television hours were scanned for both food and non-food adverts. All recorded hours were fast-forwarded through the programmes to get to the adverts. The whole adverts were watched and paused for food adverts to allow sufficient time for looking up the nutritional information on line and making the coding. All adverts were coded according to a coding scheme (Appendix two) previously used by Boyland et al. (2011), Kelly et al. (2010) and Gantz et al. (2007), classifying food products according to their effect on general health into core/healthy, non-core/unhealthy, miscellaneous foods. However, some additions to this coding were made for the current study (Appendix three), whereby food adverts were further classified based on their effect on dental health into potentially harmful and non-harmful foods. Due to the variable nature of programme sponsorship, these segments were excluded and not

coded as advertisements. However, this may lead to an underestimation of the full extent of children's exposure to food promotion on television.

6.3.2.1 Coding scheme

The full coding scheme is provided in Appendix three.

Channel, day of the week, and time of day:

The coding categories for both food and non-food adverts were the channel's name, day of the week, date, starting time of the programme in which the advertisement was shown and the time slot of the day coded according to half-hour time segments.

Programme name and type:

The programme name and type in which the advertisement was shown were recorded for both food and non-food items. The type of programme was described according to one of the following 15 categories: comedy, drama, movie, soap opera, music/music video, news/commentary, talk shows, reality, sports, entertainment/variety, documentary, games, children's, infomercial or other (Kelly et al., 2010; Gantz et al., 2007). Children's programmes were defined as any show designed for children under the age of 12 (Gantz et al., 2007).

Viewing periods:

Children's television viewing periods were classified into peak and non-peak. With regard to children's viewing hours, the peak viewing hours were between 17:30 and 22:00 hours on weekdays, and between 19:00 and 21:00 hours on weekend days (Ofcom, 2004), since that is when more than a quarter of the potential children audience is expected to be watching. All other viewing hours were considered non-peak (Ofcom, 2004).

Advertisement position:

The position of the advert, i.e. whether it was shown between or within the programme, was recorded as 0 or 1, respectively. When the advert was shown between programmes, the preceding programme was coded.

Type of product or service:

The type of product in every advertisement was coded. Twenty categories were included under this variable (Boyland et al., 2011; Kelly et al., 2010; Gantz et al., 2007). These categories were: food/drink/ supermarkets advertising for food/non-food products; clothes/shoes/ jewellery/ watches; education/ stationary; entertainment (e.g. music, video, films, entertainment parks); financial (e.g. building societies, banks, insurance, pensions); household cleaners/ detergents (e.g. washing up liquid, washing up powders, cleaning fluids); household equipment (e.g. electrical appliances); motoring (e.g. cars, petrol, trains); pet products (e.g. pet food); pharmaceutical/ health care services (e.g. medications, vitamin pills, hearing aids, eyeglasses and lenses, MRI/CT scans); public information announcements/ community service announcements (general); public information announcements (sponsored by food companies);

publishing (e.g. magazines, books, newspapers, cooking magazines); retailing and mail order (e.g. catalogues); toiletries (e.g. soap, hair shampoo, cosmetics, nappies, sanitary protection); toys; travel/ transport/ holidays; utilities (e.g. telephone, gas, electricity); channel promotions (e.g. promotions for other programmes on that channel or associated channels); and other products. One more category was added to specifically code dental health care products (e.g. toothbrushes, toothpastes, mouthwashes).

Coding of food advertisements:

Food adverts were coded for the type of food promoted, and classified based on that food's effect on general health into core, non-core, and miscellaneous foods. The primary target of the food advert and the presence of a link to a website were also recorded (Boyland et al., 2011; Gantz et al., 2007; Kelly et al., 2010). Each food advertisement was further coded based on the promoted food's effect on dental health into cariogenic food, common acidogenic food, and common food with possible anti-cariogenic and/or anti-erosive effects. Subsequent sections give details of each of these coding categories.

Type of food classified based on the effect of the promoted item on general health (core, non-core, miscellaneous foods):

Each food product was categorized as core (healthy food), non-core (unhealthy food), or miscellaneous food. Under each category, there were different food items with a simple description. After coding, the food item shown in the advert, a brand name (e.g. Cadbury) was recorded and then a detailed description about the food product was provided (e.g. Cadbury

Crunchie: honeycombed centre surrounded by milk chocolate). However, if more than one food product was shown in an advertisement, the most dominant one was coded. And when equal attention was given to different food items, the first one to be promoted was coded (Kelly et al., 2010).

Core foods are healthy foods that are required daily to meet nutrient requirements. This category includes the following items: breads (including high fibre, low fat crackers), rice, pasta and noodles; low sugar and high fibre breakfast cereals (<20g/100g sugar and >5g/100g dietary fibre); fruits and fruit products without added sugar; vegetables and vegetable products without added sugar; low fat/reduced fat milk, yoghurt, custard (<3g/100g fat) and cheese (<15g/100g fat; including 50% reduced fat cheddar, ricotta and cottage) and their alternatives (e.g. soy) (including probiotic drinks); meat and meat alternatives not crumbed or battered (including fish, legumes, eggs and nuts and nut products, peanut butter and excluding sugar-coated or salted nuts); core foods combined (including frozen meals (<10g/serve fat), soups (<2g/100g fat, excluding dehydrated), sandwiches, mixed salads and low fat savoury sauces (<10g/100g fat; including pasta simmer sauces); baby foods (excluding milk formulae); bottled water (including mineral and soda water).

Non-core foods are unhealthy foods that provide nutrients in excess of daily requirements. This category includes the following food items: high sugar and/or low fibre breakfast cereals (>20g/100g or <5g/100g dietary fibre); crumbed or battered meat and meat alternatives (e.g. fish fingers) and high fat frozen meals (>10g/serve fat); cakes, muffins, sweet biscuits, high fat

savoury biscuits, pies and pastries; snack foods, including chips, savoury crisps, snacks, popcorn, snack bars, muesli bars, sugar sweetened fruit and vegetable products (such as jelly fruit cups, fruit straps) and sugar-coated nuts; fruit juice and fruit drinks; frozen/fried potato products (excluding packet crisps); full cream milk, yoghurt, custard, dairy desserts (>3g/100g fat) and cheese (25% reduced fat and full fat varieties, and high salt cheese including haloumi and feta) and their alternatives; ice cream and iced-confection; chocolate and confectionery (including regular and sugar-free chewing gum and sugar); fast food restaurants/meals (including general pizza, burgers, 'healthy' alternatives from fast food restaurants); high fat/sugar/salt spreads (including yeast extracts and excluding peanut butter), oils, high fat savoury sauces (>10g/100 fat), meal helpers (including stocks, tomato paste) and soups (>2g/100g fat tinned and all dehydrated); sugar sweetened drinks including soft drinks, cordials, electrolyte drinks and flavour additions e.g. Milo); alcohol.

The third category, which is for miscellaneous foods, includes the following items: vitamin and mineral supplements and sweeteners; tea and coffee; supermarkets – advertising mostly non-core foods; supermarkets – advertising mostly core foods; supermarkets – non-specified (generic supermarket ads or not clearly definable as core or non-core); baby and toddler milk formulae; home food delivery services.

Some fast food restaurant adverts promote healthy products. In doing so, these companies are trying to promote the brand itself more than the item, thereby trying to create a positive image

for the brand by showing healthy product in their advertisements. Such an advert was still coded as a non-core food product.

Primary target of food adverts:

Food advertisements were coded in terms of the advert's intended audience. Certain factors were used to help determine the target audience and reduce the subjectivity of coding this category; for instance, the age of the actors in the adverts and the nature of their appeal. The primary target variable was divided into five categories, which were: children and/ or teens; teens and adults; adults (20-64 years); older adults (65+ years); and all ages (Gantz et al., 2007).

Link(s) to website in food adverts:

The presence (or not) of a website address mentioned or flashed up on the screen for the food product/brand was coded, showing whether the company is directing the audience to its website (Gantz et al., 2007).

Type of foods classified based on their effect on dental health:

As the main focus of my research was to examine the extent and nature of advertising of foods and beverages that have an effect on dental health, food adverts were further classified into cariogenic food, common acidogenic food, and common food with possible anti-cariogenic and/or anti-erosive effects. For adverts promoting more than one food product, several factors were taken into account for the sake of achieving consistency and precision in coding these types of adverts. If more than one food product was promoted in the advertisement, the most

dominant one was coded. If equal attention was given to different food products, the first item shown was coded (Kelly et al., 2010). However, if different food products were shown at the same time and equal attention was given to all of them, they were coded as non-specified food items. Adverts for supermarkets promoting non-food products were coded as supermarkets – advertising non-food products (e.g. a DVD from ASDA), or supermarkets – promoting dental health care products (e.g. toothpaste from Tesco).

Cariogenic food:

Foods and drinks that have the potential to cause dental caries were classified based on their sugar content, according to the sugar values mentioned in the traffic light signposting scheme, which has been developed by the British Food Standards Agency (FSA) to indicate the proper or improper amount of four nutrients: fat, saturated fat, sugar and sodium (Appendix 1). With regard to sugar levels, foods and drinks were classified into foods/drinks with zero sugar level, foods/drinks with low sugar level (0.1 - ≤1.8 g/100g or 100ml), foods/drinks with medium sugar level (1.9 – 9.0 g/100g or 100ml), foods/drinks with high sugar level (9.1 – 32.5 g/100g or 100ml), and foods/drinks with very high sugar level (≥ 32.6 g/100g or 100ml) (Hieke and Wilczynski, 2012). The type of foods and beverages containing a very high sugar level were classified, based on the Nizel and Papas classification of sweet scoring, into liquid, slowly dissolving food, solid and sticky foods (Nizel and Papas, 1989).

Common acidogenic food:

Coding was applied for the common acidogenic foods/drinks with erosive potential, such as soft drinks (e.g. carbonated and diluted squashes), fresh fruit juices, fruit juice drinks, and fruit/acidic sweets (e.g. acidic fruit drops) (Moynihan, 2002).

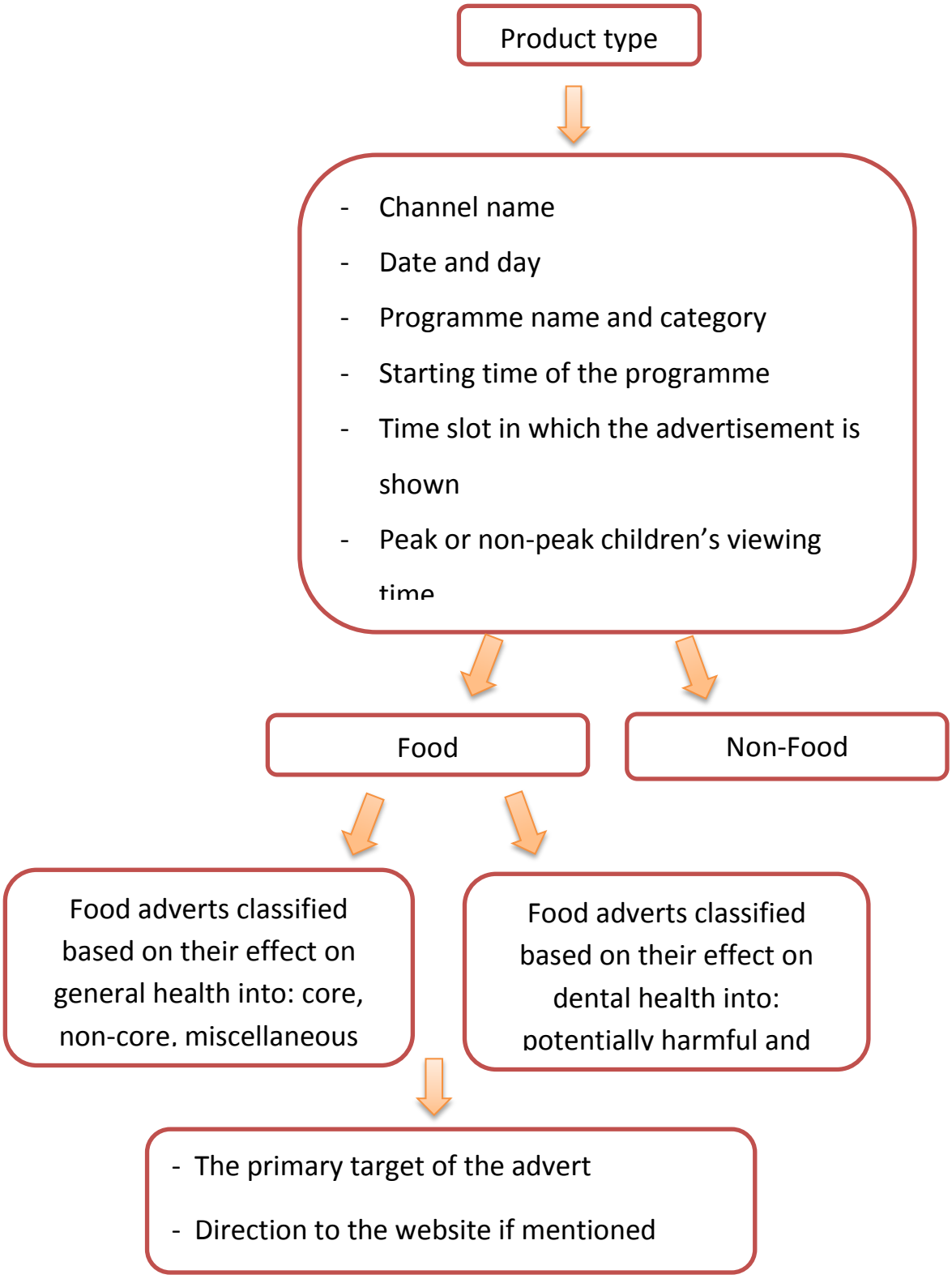
Common foods with possible anti-cariogenic and/or anti-erosive effect:

Common foods and beverages with possible anti-cariogenic and/or an anti-erosive effect, such as milk, cheese, peanuts, sugar-free chewing gum, xylitol sweeteners and gum and tea (unsweetened) were coded (Moynihan, 2002).

6.3.2.2: Coding procedure

Coding of all the recorded hours was performed by a single researcher (Al-Mazyad, M.). To assess reliability of coding between researchers, a random hour sample of television recording was coded by both researchers (Boyland, E. and Al-Mazyad, M), and compared for consistency. Recordings were copied in blocks of four recorded hours from a hard disk drive onto DVD discs for coding. Coding was logged on a pre-prepared Microsoft Excel 2010 spreadsheet.

6.4 Monitoring design



7.0 STATISTICAL ANALYSIS

Coding made on a Microsoft Excel 2010 spreadsheet was imported into a Statistical Package for the Social Sciences software (SPSS version 21.0, IBM Corporation, Armonk: NY), which was used for the data analysis. Descriptive statistics including frequencies, percentages, confidence intervals (CI), and cross tabulation were used. Binary logistic regression analysis was used to ascertain the odd ratio that helps in identifying any relationship between adverts for foods potentially harmful to dental health and other factors such as children's programmes, and children's peak and non-peak viewing hours. Pearson's chi-squared test was used to assess the association between adverts for foods potentially harmful to dental health and the other independent variables, which included peak and non-peak children's viewing hours, advertising patterns between weekends and weekdays, advertising patterns across the year, programme category, viewing adverts between or within programmes, primary target, and link(s) to website. Statistically significant results for the relationship between the variables were assessed using Pearson's chi-squared test asymptotic significance (2-sided) value at or below 0.05 level.

8.0 RESULTS

Inter-examiner reliability:

Agreement between coders on product category was 95% and food product type classification was 92% in agreement.

Data Cleansing:

All the collected data were checked and adjusted for any missing values or inconsistencies found in the scores made for each advertised food product.

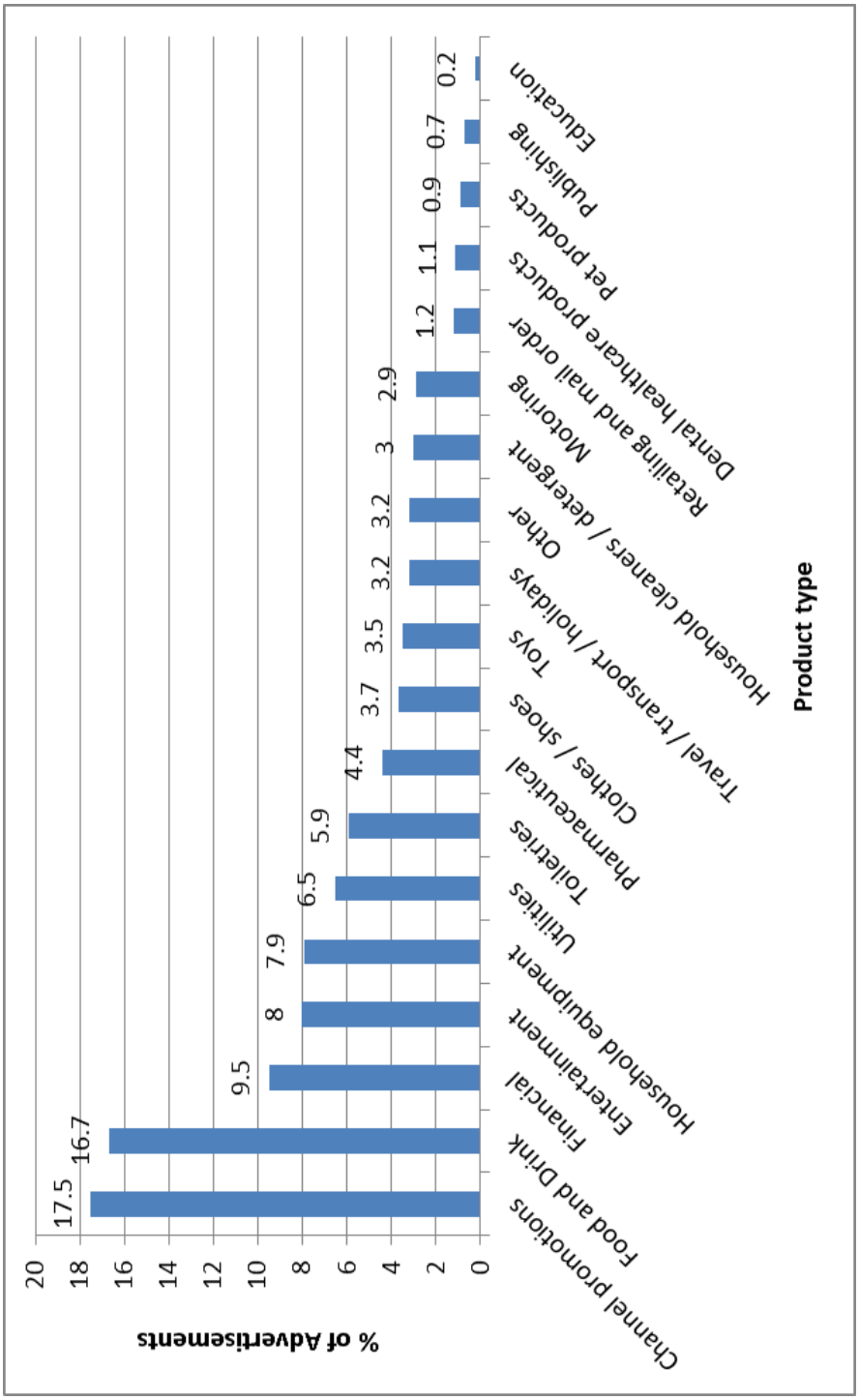
8.1. The extent of advertising of food products

The overall recorded sample of 352 hours, included 9151 adverts for different product types (Table 8.1 - figure 8.1). The most commonly advertised item was channel promotions, which accounted for 17.5% of all adverts, closely followed by food and drink products, with 16.7% of all adverts. Food and drinks with channel promotions represented more than one third of all advert types, accounting for 3,130 out of 9,151 (34.2%). Further down the list, dental healthcare product adverts were estimated to represent only 1.1% and considered to be the fourth least commonly advertised product type among all adverts.

Table 8.1: Number and percentage of advert product types:

Product type	Number of adverts	% of adverts
Channel promotions	1598	17.5
Food and Drink	*1532*	*16.7*
Financial	873	9.5
Entertainment	734	8
Household equipment	727	7.9
Utilities	591	6.5
Toiletries	538	5.9
Pharmaceutical	399	4.4
Clothes / shoes	339	3.7
Toys	316	3.5
Travel / transport / holidays	294	3.2
Other	294	3.2
Household cleaners / detergent	277	3
Motoring	268	2.9
Retailing and mail order	114	1.2
Dental healthcare products	101	1.1
Pet products	78	0.9
Publishing	61	0.7
Education	17	0.2
Total	9151	100

Figure 8.1: Percentage of advert product types:



8.1.1: The extent of advertising of foods and beverages, classified based on their effect on general health (core, non-core and miscellaneous food products)

The percentage of food adverts, classified based on their effect on general health, is detailed in table 8.2 and figure 8.2. Non-core foods comprised 43.9% of all food adverts, and accounted for a higher proportion compared to miscellaneous (38.5%) and core foods (17.6%).

Table 8.2: Number and percentage of food adverts, classified based on their effect on general health

Food type	Number of adverts	% of adverts
Core / healthy foods	269	17.6
Non-core / unhealthy foods	673	43.9
Miscellaneous adverts	590	38.5
Total	1532	100

Figure 8.2: Percentage of core, non-core and miscellaneous food adverts

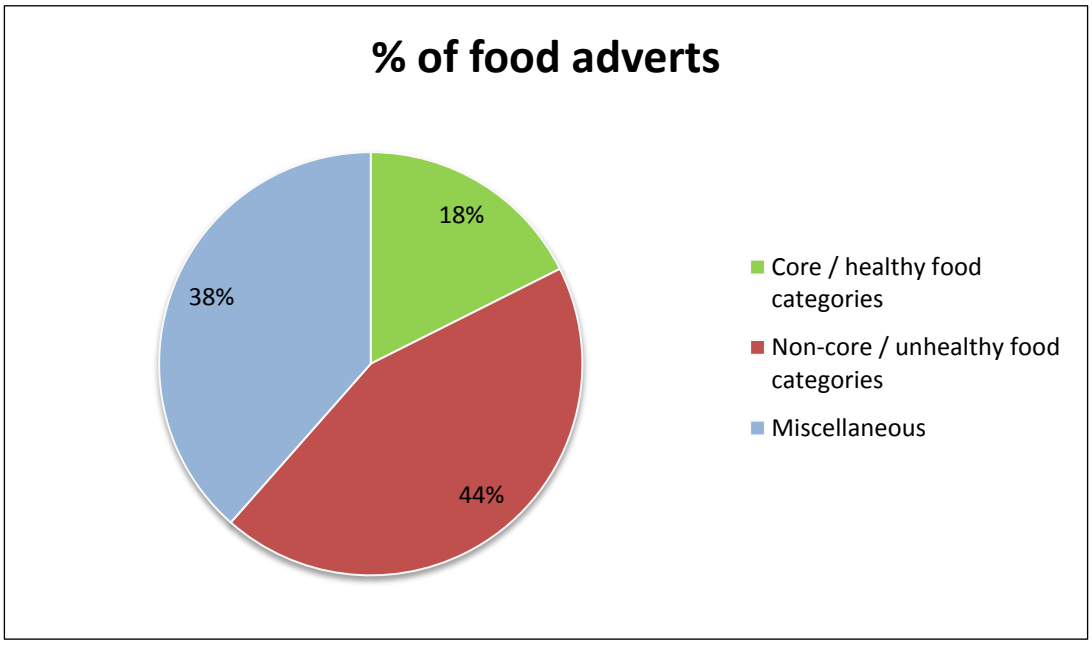


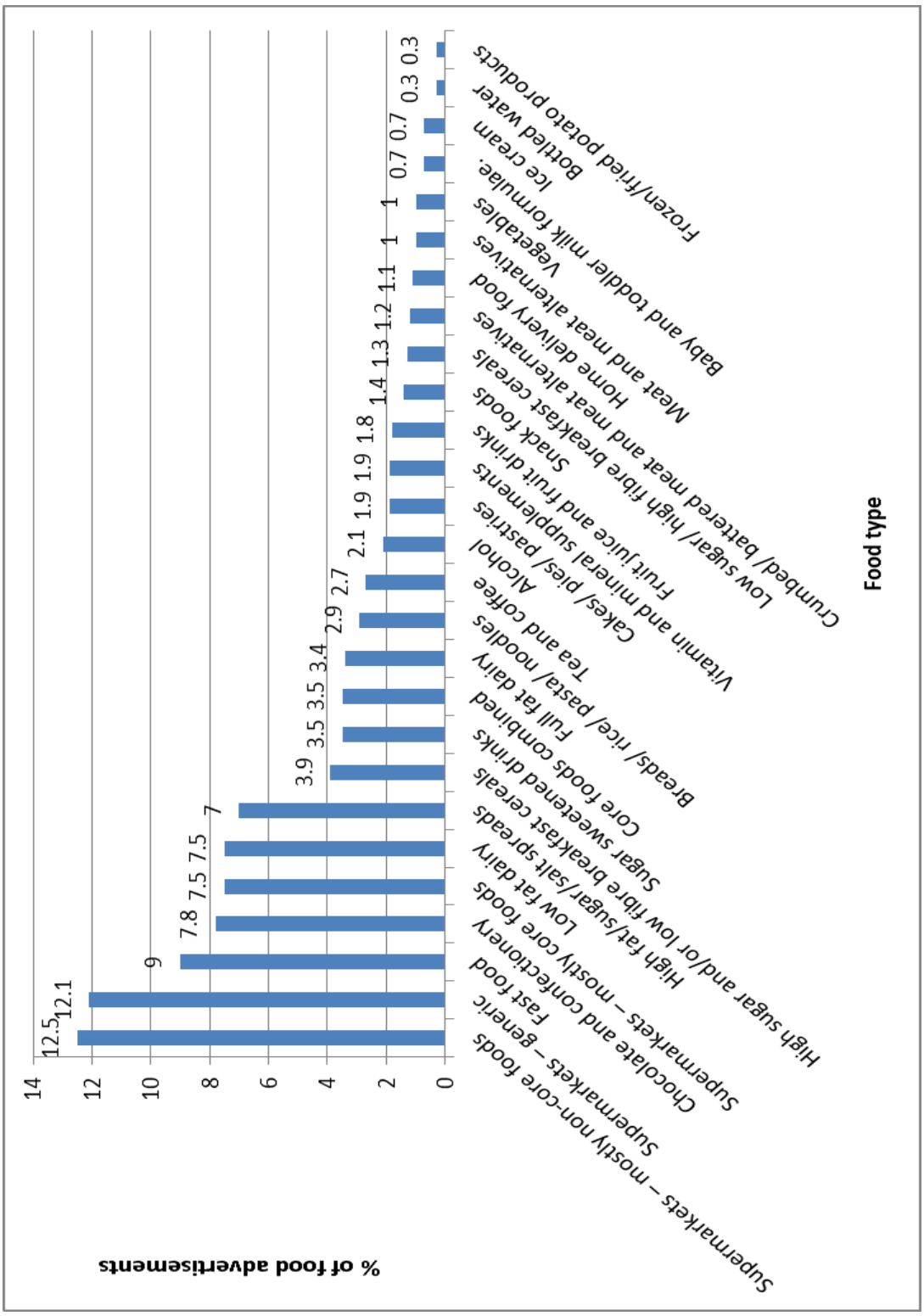
Table 8.3 and figure 8.3 show the proportion of different types of advertised food products. The most heavily advertised food products were supermarket promotions for, mostly, non-core foods (12.5%), followed closely by supermarkets promoting generic products (12.1%). Fast foods were the third most commonly advertised products, at 9% of all food adverts. Chocolate and confectionery accounted for 7.8% of all food adverts and represented the fourth most heavily advertised food product. Both low fat dairy products and supermarkets promoting mostly core food products comprised the same proportion, with each representing 7.5% of all food adverts, closely followed by high fat, high sugar or high salt spreads, which represented 7% of all food products.

Table 8.3: Number and percentage of advertised food products:

Food product category	Number of adverts	% of adverts
Supermarkets – mostly non-core foods	191	12.5
Supermarkets – generic	186	12.1
Fast food	138	9
Chocolate and confectionery	119	7.8
Supermarkets – mostly core foods	115	7.5
Low fat dairy	115	7.5
High fat/sugar/salt spreads	108	7
High sugar and/or low fibre breakfast cereals	59	3.9
Sugar sweetened drinks	54	3.5
Core foods combined	54	3.5
Full fat dairy	52	3.4
Breads/ rice/ pasta/ noodles	44	2.9
Tea and coffee	41	2.7
Alcohol	32	2.1
Cakes/ pies/ pastries	29	1.9
Vitamin and mineral supplements	29	1.9
Fruit juice and fruit drinks	27	1.8
Snack foods	21	1.4
Low sugar/ high fibre breakfast cereals	20	1.3

Crumbed/ battered meat and meat alternatives	19	1.2
Home delivery food	17	1.1
Meat and meat alternatives	16	1
Vegetables	15	1
Baby and toddler milk formulae	11	0.7
Ice cream	11	0.7
Bottled water	5	0.3
Frozen/fried potato products	4	0.3
Total	1532	100

Figure 8.3: Percentage of advertised food products:



8.1.2 The extent of advertising of foods and beverages, classified based on their effect on dental health

Food adverts, which made up 16.7% of all ITV 1 adverts, were classified, based on their effect on dental health, into foods/ drinks which were potentially harmful (61%) and non-harmful (39%) to dental health (Figure 8.4).

Adverts for food potentially harmful to dental health accounted for nearly two thirds of all food adverts (Figure 8.4). This category was divided into three groups (Figure 8.5). Cariogenic food products dominated the advertisements for foods potentially harmful to dental health, representing 89% of this type of food advert. Common acidogenic food products (3.4%) and cariogenic and acidogenic food products (7.6%) were less commonly promoted in advertisements.

Adverts for foods/ products considered potentially non-harmful to dental health comprised around one third of food adverts and were divided into five groups (Figure 8.4). Adverts for non-cariogenic and non-erosive foods accounted for 28.8% of this type of food advert, and included foods that don't cause erosion and have zero sugar level (e.g. fish). Adverts promoting more than one food product, giving equal attention to each and shown at the same time, were coded under non-specified food adverts (28.9%). Adverts for supermarkets promoting non-food products (e.g. washing powder) and dental healthcare products (e.g. tooth paste) accounted for 24.4% and 1.3%, respectively, of adverts for products/ foods potentially non-

harmful to dental health. Adverts for food with possible anti-cariogenic and/or anti-erosive effects accounted for 16.6% of this type of food advert.

Figure 8.4: Flow chart for food adverts, classified based on their effect on dental health, and non-food adverts:

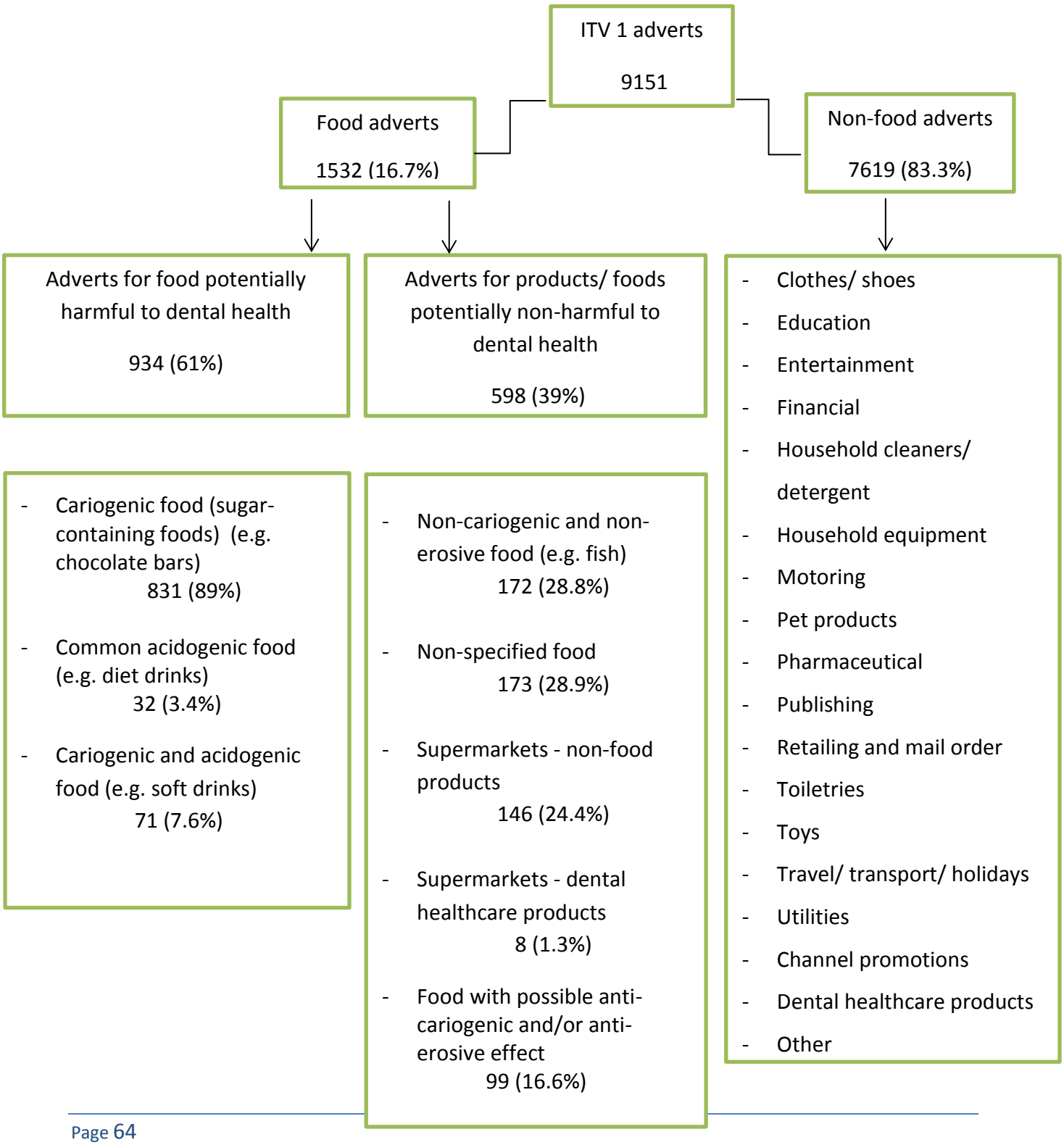
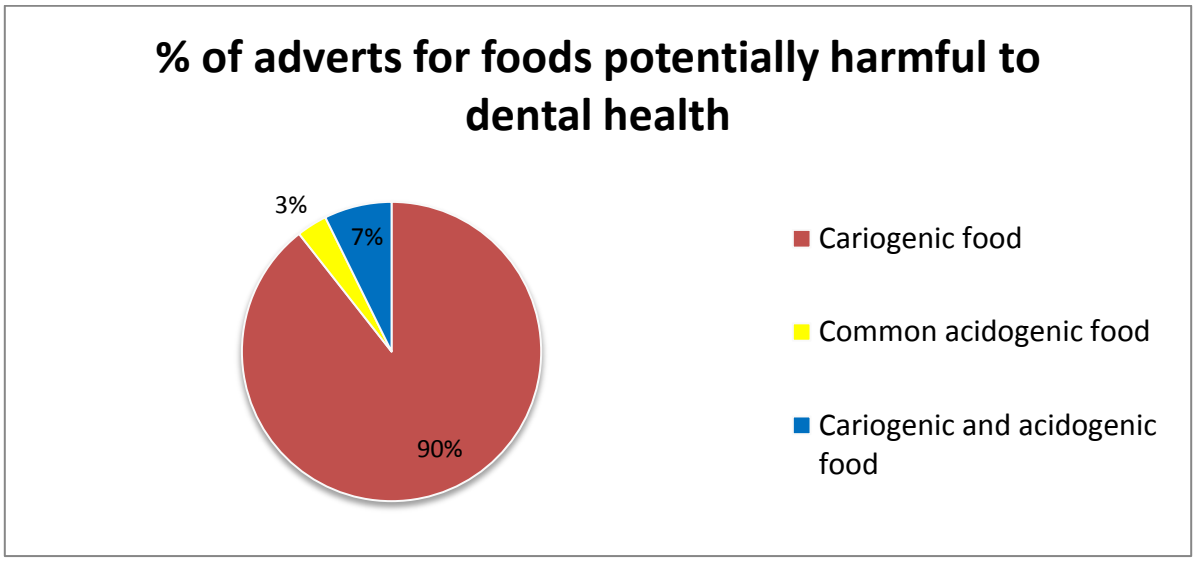


Figure 8.5: Percentage of adverts for food potentially damaging to dental health:



8.1.2.1. Food potentially harmful to dental health

8.1.2.1.1. The extent of advertising of different types of cariogenic foods/drinks

Cariogenic food adverts were classified, based on their sugar level, into low, medium, high and very high sugar levels (Table 8.4 – figure 8.6). Food products with medium sugar levels (1.9-9.0 g/100 g or 100 ml) were the most commonly advertised cariogenic products, with 40.6% of all cariogenic food adverts, representing almost double the amount of advertising for each of the other cariogenic food products. However, the proportion of adverts for cariogenic foods with > 9 g/100g or 100ml, in both foods with high and very high sugar levels, accounted for 44.7% of all cariogenic food adverts, contributing to the majority of food advertisements in this category. The proportion of advertised food with high sugar levels (9.1-32.5 g/100g or 100ml) and very

high sugar levels (≥32.6 g/100 g or 100 ml) was 24.2% and 20.5% of all cariogenic food adverts, respectively. Foods with low sugar levels (0.1 - 1.8 g/100 g or 100 ml) were the least commonly advertised products, with only 14.7% of all cariogenic food adverts.

Food adverts for products containing very high sugar levels were sub-classified, based on the consistency of the product, into liquid, slowly dissolving, solid and sticky (Table 8.4 – figure 8.7). Sticky foods dominated the advertisements in this group and comprised almost 50% of the overall percentage of food adverts for products containing very high sugar levels. The second most commonly advertised products among foods with very high sugar levels were solid foods (38%). Liquids and slowly dissolving foods were less commonly advertised, representing only 12% and 1% of all adverts of food products containing very high sugar levels, respectively.

Table 8.4: Number and percentage of cariogenic food adverts

Cariogenic Food	Number of adverts	% of adverts
Food/drink products with low sugar level	133	14.7
Food/drink products with medium sugar level	366	40.6
Food/drink products with high sugar level	218	24.2
Food/drink products with very high sugar level – liquid	22	2.4
Food/drink products with very high sugar level – slowly dissolving food	3	0.3
Food/drink products with very high sugar level – solid	70	7.8
Food/drink products with very high sugar level – sticky	90	10
Total	902	100

Figure 8.6: Percentage of cariogenic food adverts, classified based on their sugar level

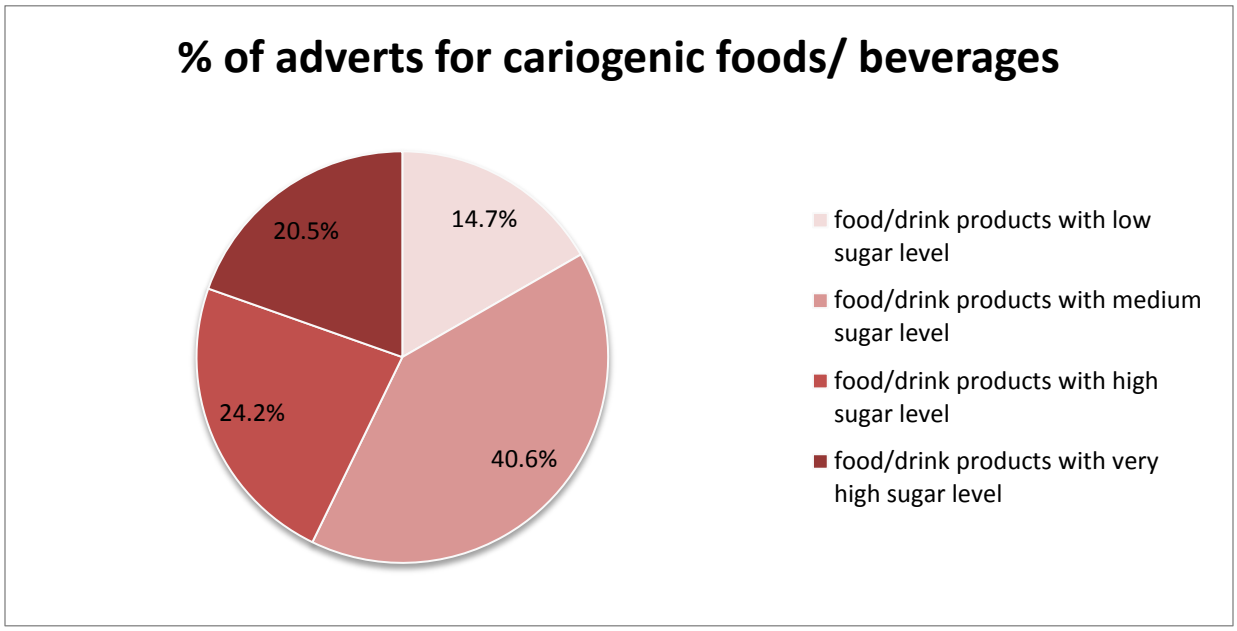
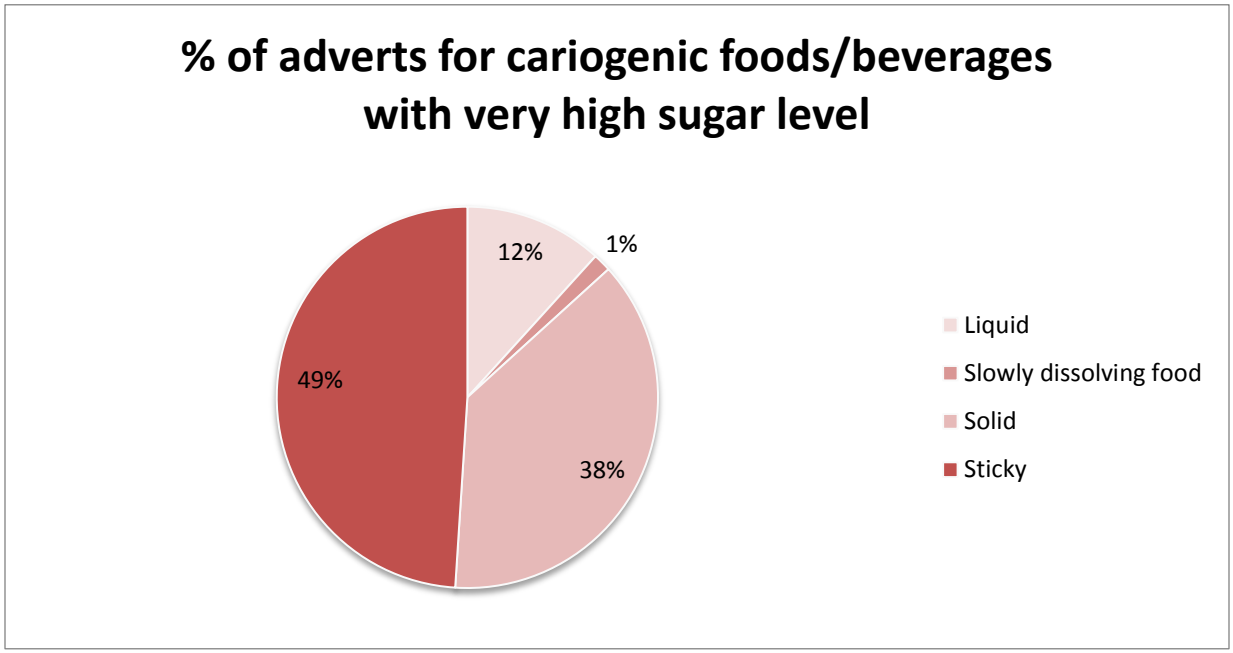


Figure 8.7: Percentage of adverts for food/ drink products with very high sugar levels, classified based on the consistency of the product



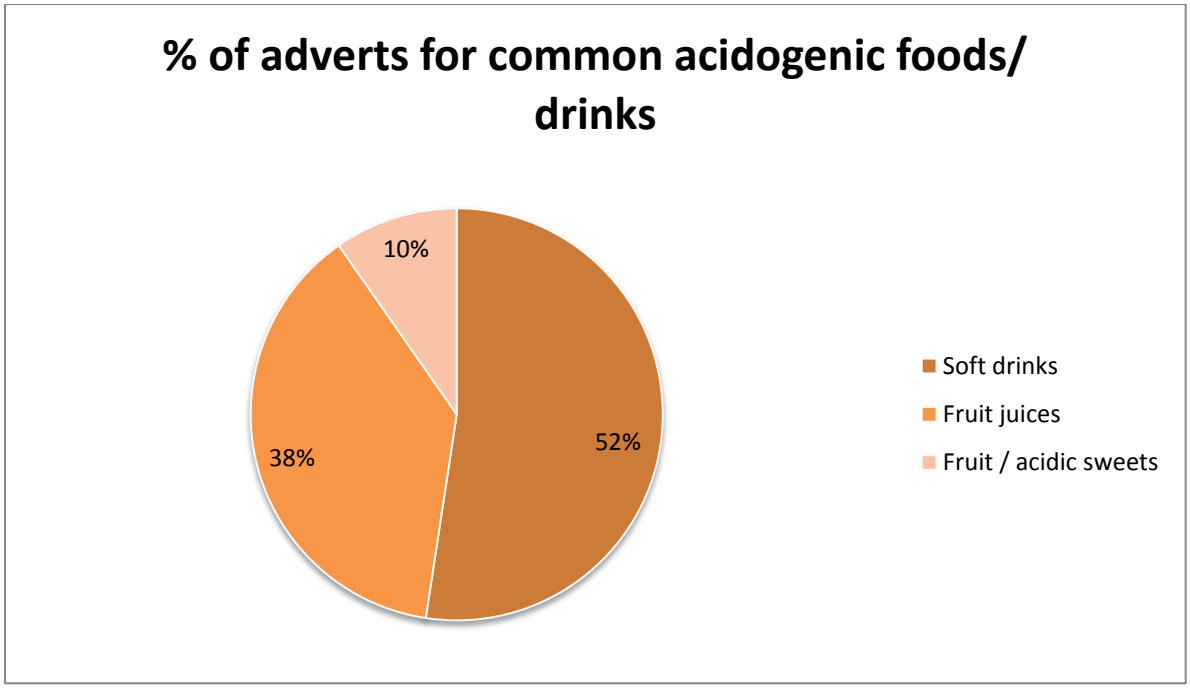
8.1.2.1.2 The extent of advertising of various types of acidogenic foods/drinks

Out of the 1532 food adverts that were coded, only 103 adverts were for acidogenic foods/beverages. Table 8.5 shows the extent of advertising of common acidogenic foods, which is also illustrated in the pie chart in figure 8.8. Soft drinks dominated the acidogenic foods/ drinks advertisements, representing 52.4% of all acidogenic food/drinks adverts. Fruit juices were the second most commonly advertised products, accounting for more than one third (37.9%) of all acidogenic food/drinks adverts. Adverts for fruit and acidic sweets were the least commonly advertised product.

Table 8.5: Number and percentage of adverts for common acidogenic foods

Acidogenic foods/ drinks	Number of adverts	% of adverts
Soft drinks	54	52.4
Fruit juices	39	37.9
Fruit/ acidic sweets	10	9.7
Total	103	100

Figure 8.8: Percentage of adverts for common acidogenic foods



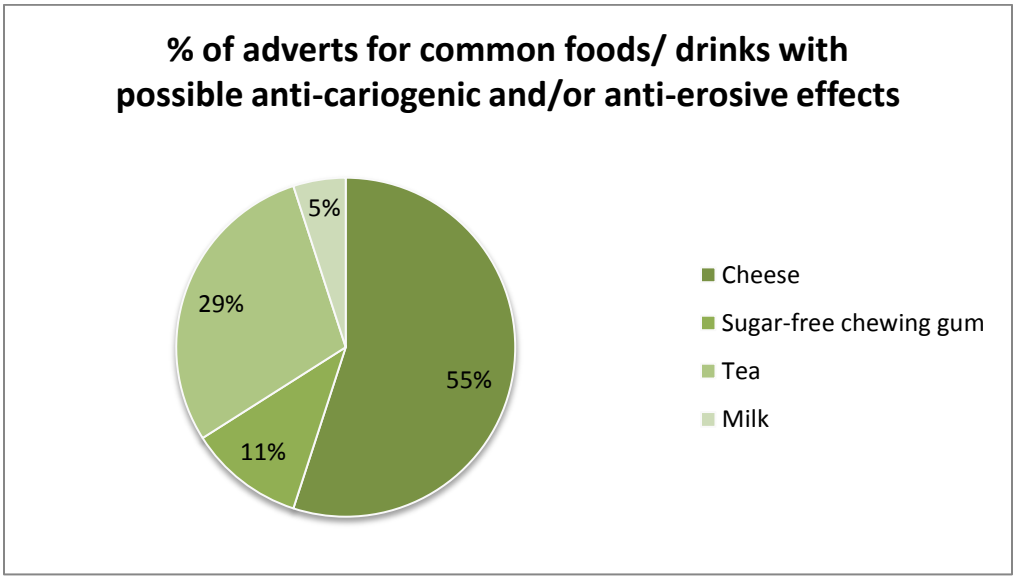
8.1.2.2. The extent of advertising of common foods/ drinks with possible anti-cariogenic and/ or anti-erosive effects

Out of the 1532 food adverts, only 99 adverts were for common foods/ drinks with possible anti-cariogenic and/ or anti-erosive effect (Table 8.6 – figure 8.9). Cheese formed the majority of all the adverts in this category (55 %). Tea adverts were next with 29% of all adverts for foods/ drinks with possible anti-cariogenic and/ or anti-erosive effect. Adverts for sugar-free chewing gum and milk without added sugar represented a smaller proportion, accounting for only 11% and 5% of all adverts in this category, respectively.

Table 8.6: Number and percentage of adverts for common foods/ drinks with possible anti-cariogenic and/or anti erosive effects

Common foods/ drinks with possible anti-cariogenic and/or anti-erosive effects.	Number of adverts	% of adverts
Cheese	54	55
Tea	29	29
Sugar-free chewing gum	11	11
Milk	5	5
Total	99	100

Figure 8.9: Percentage of adverts for common food with possible anti-cariogenic and/ or anti-erosive effects



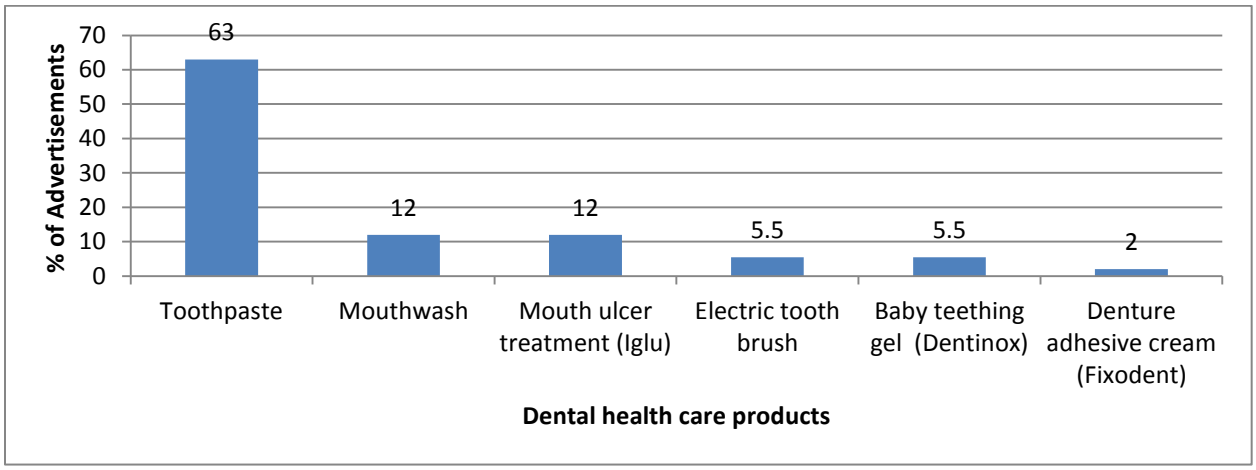
8.2 The extent of advertising of different dental healthcare products

The total number of adverts promoting dental healthcare products was 109 (Table 8.7 – figure 8.10), which included 101 adverts in the non-food adverts category and eight adverts for supermarkets promoting dental healthcare products. Adverts for toothpaste products represented more than half of these adverts, which accounted for 63% of all dental healthcare product adverts. Mouthwash adverts had the same percentage as mouth ulcer treatment (Iglu) adverts, and both shared the second highest proportion of adverts promoting dental healthcare products. Further down the list, electric tooth brush adverts (5.5%) accounted for the same percentage as baby teething gel (Dentinox) adverts (5.5%). Of the adverts promoting dental healthcare products, the least commonly advertised products were denture adhesive cream (Fixodent), which accounted for only 2% of dental healthcare product adverts.

Table 8.7: Number and percentage of adverts promoting different dental healthcare products

Dental Healthcare products	Number of adverts	% of adverts
Toothpaste	69	63
Mouthwash	13	12
Mouth ulcer treatment (Iglu)	13	12
Electric tooth brush	6	5.5
Baby teething gel (Dentinox)	6	5.5
Denture adhesive cream (Fixodent)	2	2
Total	109	100

Figure 8.10: Percentage of adverts promoting different dental healthcare products



8.3 Variations in advertising patterns:

8.3.1 Variations in advertising patterns for foods/ beverages during peak and non-peak children's viewing times

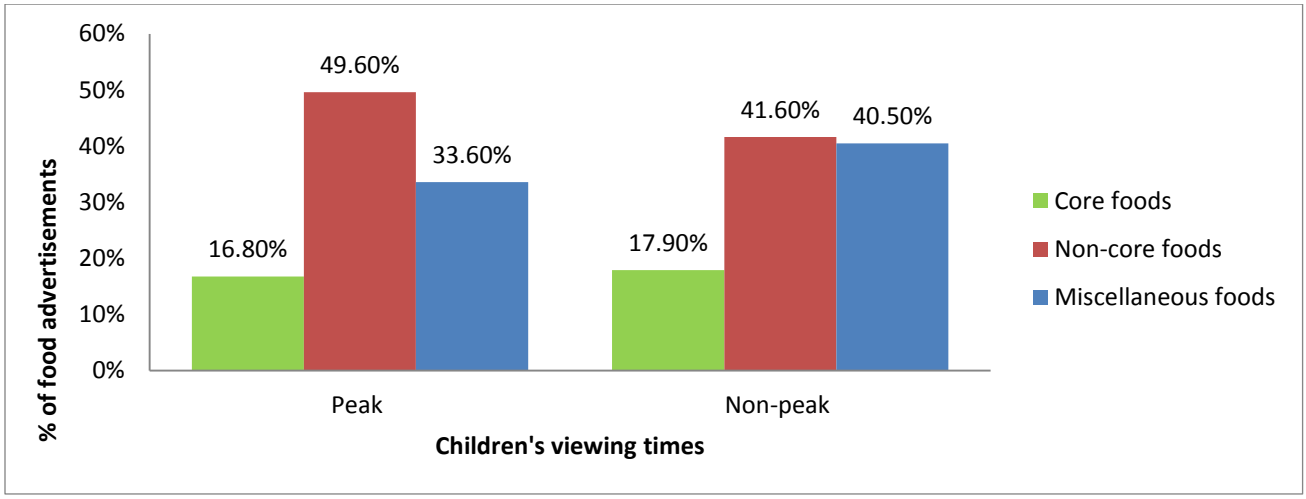
8.3.1.1 The extent of advertising food products classified based on their effect on general health (core, non-core and miscellaneous foods)

Table 8.8 shows there were significant differences in the extent of advertising different types of food between peak and non-peak children's viewing times ($p = 0.013$). During both peak and non-peak children's viewing times, non-core foods were the most commonly advertised food product type, representing 49.6% of all food adverts during peak children's viewing times, and 41.6 %, during non-peak children's viewing times. There was a significant difference between the proportion of non-core foods compared to the proportion of other food types during peak and non-peak children's viewing times ($p = 0.013$). Miscellaneous foods were the second most commonly advertised food product during peak (33.6%) and non-peak (40.5%) children's viewing times, respectively. Core foods were the least commonly advertised food product type during peak (16.8%) and non-peak (17.9%) children's viewing times (Figure 8.11).

Table 8.8: Number and percentage of adverts for different food types promoted during peak and non-peak children's viewing times:

Food type	Adverts in peak children's viewing times	Adverts in non-peak children's viewing times	Total
Core foods	75 (16.8%) (27.9%)	194 (17.9%) (72.1%)	269 (100%)
Non-core foods	221 (49.6%) (32.8%)	452 (41.6%) (67.2%)	673 (100%)
Miscellaneous foods	150 (33.6%) (25.4%)	440 (40.5%) (74.6%)	590 (100%)
Total	446 (100%)	1086	1532

Figure 8.11: Percentage of adverts of different food types promoted during peak and non-peak children's viewing times:



8.3.1.2 The extent of advertising of foods potentially harmful and non-harmful to dental health during peak and non-peak children's viewing times:

Figure 8.12 and table 8.9 show the extent of the advertising of foods harmful and non-harmful to dental health during peak children's viewing times. During peak time, food potentially harmful to dental health formed the bulk of food advertisements, accounting for nearly two thirds (65.9%) of all food advertisements shown during that time, significantly higher than the proportion of adverts of foods/ products potentially non-harmful to dental health (34.1%) ($p = 0.011$). Indeed, the odds of a food advertisement being for food potentially harmful to dental health during peak children's viewing times is 1.35 (95%CI; 1.07-1.70).

Table 8.9 also shows that of all adverts for foods potentially harmful to dental health, 31.5% of these were promoted during peak children's viewing times, while only 25.4% of all adverts for foods/ products potentially non-harmful to dental health were shown during the same period. During both peak and non-peak children's viewing hours, the number of adverts for foods potentially harmful to dental health was significantly higher than the number of adverts for foods potentially non-harmful to dental health ($p = 0.011$) (Figure 8.13 – table 8.9).

Table 8.9: Number and percentage of adverts for food potentially harmful and non-harmful to dental health during peak and non-peak children's viewing times:

Food type	Adverts in peak children's viewing times	Adverts in non-peak children's viewing times	Total
Food potentially harmful to dental health	294 (65.9%) (31.5%)	640 (68.5%)	934 (100%)
Food potentially non-harmful to dental health	152 (34.1%) (25.4%)	446 (74.6%)	598 (100%)
Total	446 (100%)	1086	1532

Figure 8.12: Percentage of adverts for food potentially harmful and non-harmful to dental health during peak children's viewing times

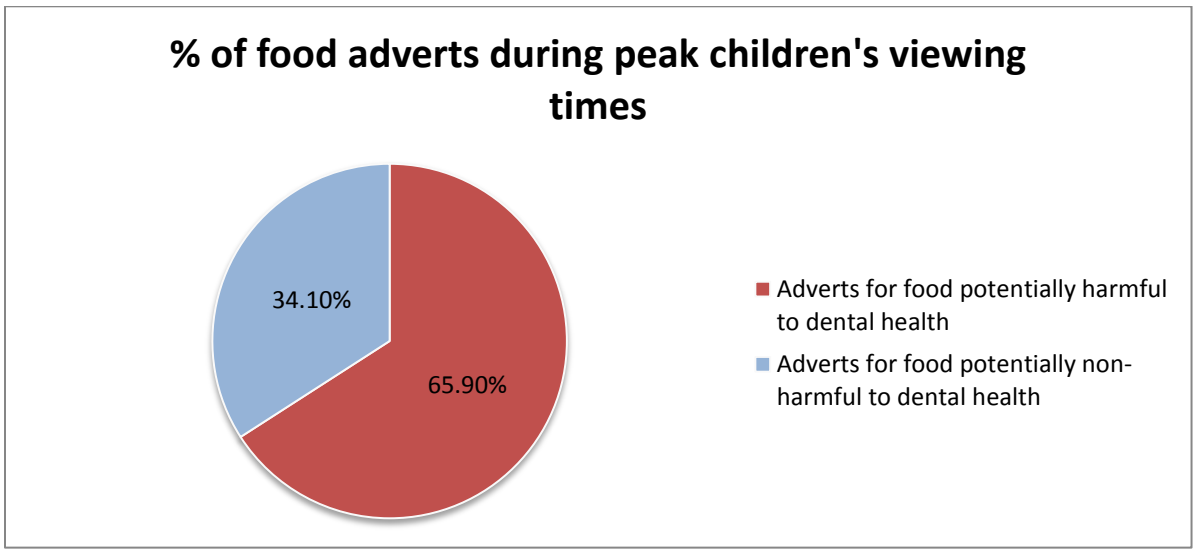
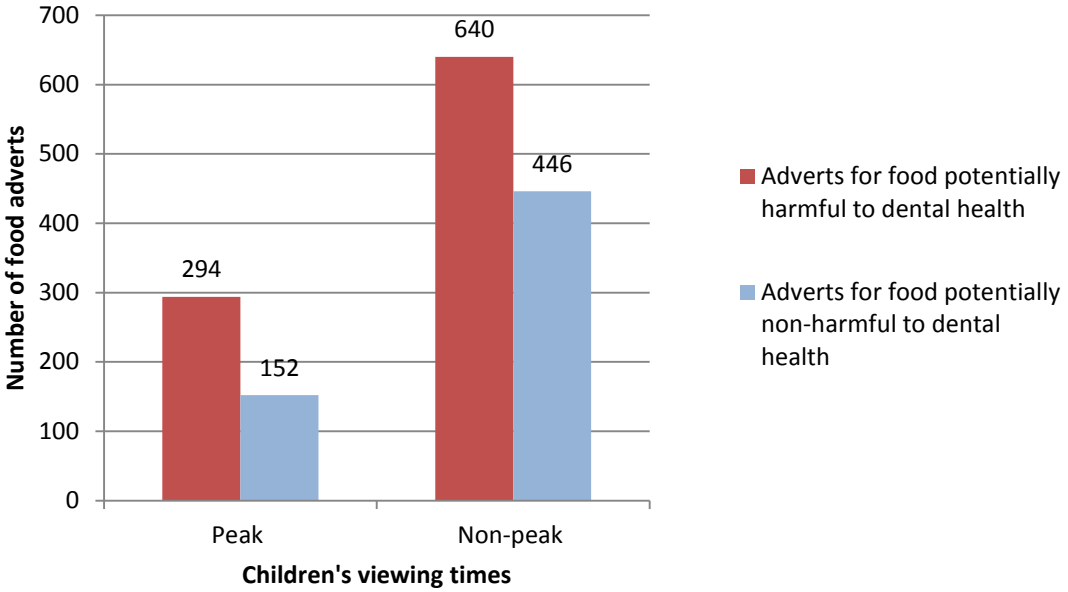


Figure 8.13: Number of adverts for foods potentially harmful and non-harmful to dental health during peak and non-peak children's viewing times:



* The difference in absolute numbers between peak and non-peak should be considered in the context of non-peak viewing time constituting a much greater proportion of recorded time than peak.

8.3.2 Variations in the food advertising patterns between weekends and weekdays

The extent of advertising for foods potentially harmful to dental health on weekdays (49.8%) and weekends (50.2%) showed no statistically significant difference (p = 0.298) (Table 8.10).

Table 8.10: Number of adverts for food potentially harmful and non-harmful to dental health shown during weekdays and weekend days:

Food type	Number of adverts shown during weekdays	Number of adverts shown during weekend days	Total
Food potentially harmful to dental health	465 (59.7%)	469 (62.3%)	934 (61%%)
Food potentially non-harmful to dental health	314 (40.3%)	284 (37.7%)	598 (39%)
Total	779 (100%)	753 (100%)	1532 (100%)

8.3.3 Monthly variations in the food advertising patterns across the year

The monthly variations of advertising patterns for foods potentially harmful to dental health across the year were found to be significant ($p < 0.001$). When comparing the extent of advertising foods potentially harmful to dental health for each month across the year (Table 8.11), the highest percentage for advertising such types of food was in March (70.7%), whereas the lowest was seen in December (42.8%), the only month in which the extent of adverts for foods potentially harmful to dental health was less than the extent of adverts for foods/ products potentially non-damaging to dental health.

Table 8.11: Number and percentage of adverts for foods potentially damaging to dental health shown during each month across the year

Month	Adverts for food potentially harmful to dental health	Adverts for food potentially non-harmful to dental health	Total
January	77 (52.7%)	69 (47.3%)	146
February	30 (62.5%)	18 (37.5%)	48
March	118 (70.7%)	49 (29.3%)	167
April	91 (69.5%)	40 (30.5%)	131
May	125 (70.2%)	53 (29.8%)	178
June	76 (70.4%)	32 (29.6%)	108
July	53 (59.6%)	36 (40.4%)	89
August	71 (56.8%)	54 (43.2%)	125
September	55 (61.8%)	34 (38.2%)	89
October	92 (61.3%)	58 (38.7%)	150
November	72 (56.3%)	56 (43.8%)	128
December	74 (42.8%)	99 (57.2%)	173
Total	934 (61.0%)	598 (39%)	1532

Figure 8.14: The extent of advertising for foods potentially harmful and non-harmful to dental health shown during each month across the year

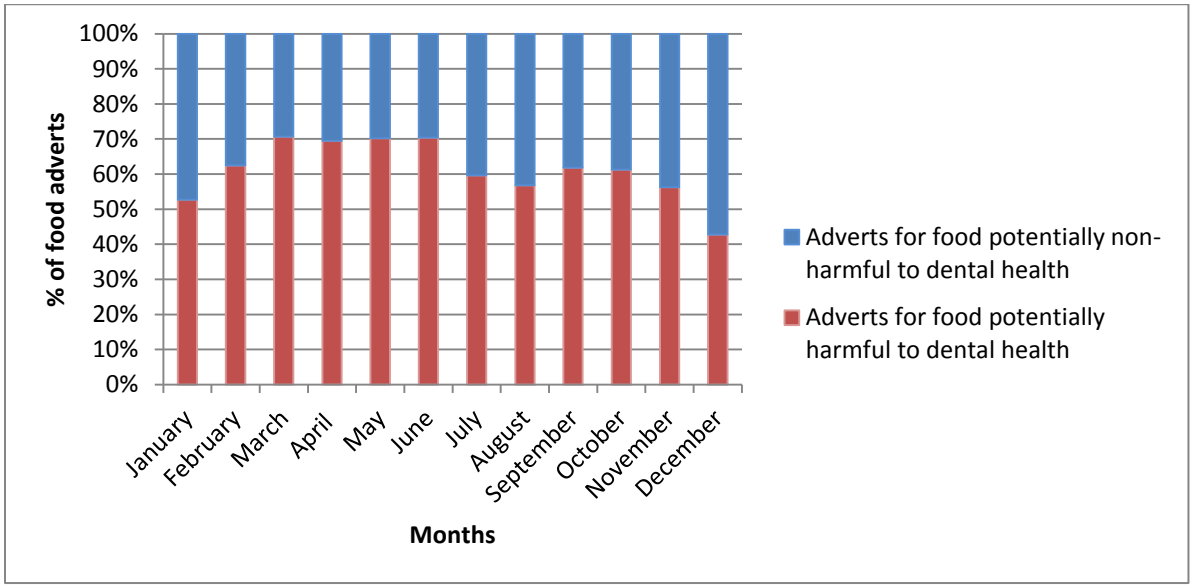


Figure 8.14 shows the variation in the extent of advertising patterns for foods both harmful and non-harmful to dental health during each month across the year. Clearly, the extent of advertising for foods potentially harmful to dental health was generally higher than that of advertising for foods/ products potentially non-harmful to dental health across the year, with the exception of December. The graph also shows that the extent of advertising for foods potentially harmful to dental health started the year with a gradual increase, reaching its highest point from March to June then declining gradually during the summer, between July and August. During September and October, it increased slightly again, then decreased in November and continued to decrease towards the end of the year until it reached its lowest point in December.

8.4 Programme categories

8.4.1. The extent of advertising for foods potentially harmful to dental health within different programme categories

The extent of advertising for foods potentially harmful to dental health shown during different programme categories showed up considerable variation (Table 8.12 - figure 8.15). Although the number of adverts for food potentially harmful to dental health was less than 1% in children's programmes, those adverts were shown more during other programmes watched by children and young people. Nearly a half (42.7 %) of all adverts for food potentially harmful to dental health was promoted in or around entertainment programmes (25.9 %) and game shows (16.8 %), which carried a significantly larger number of adverts for foods potentially harmful to dental health than all other programmes ($p < 0.001$).

Table 8.12: Number and percentage of adverts for foods potentially harmful to dental health shown during different programme categories

Programme category	Number of adverts for foods potentially harmful to dental health	% of adverts for foods potentially harmful to dental health
Entertainment/ Variety	242	25.9
Games	157	16.8
News/ Commentary	150	16.1
Talk shows	111	11.9
Drama	93	10
Movie	64	6.9
Comedy	30	3.2
Documentary	23	2.5
Soap opera	14	1.5
Sports	14	1.5
Other	13	1.4
Reality	10	1.1
Children's	7	0.7
Music/ Music video	6	0.6
Total	934	100

Figure 8.15: Percentage of adverts for foods potentially harmful to dental health shown during different programme categories

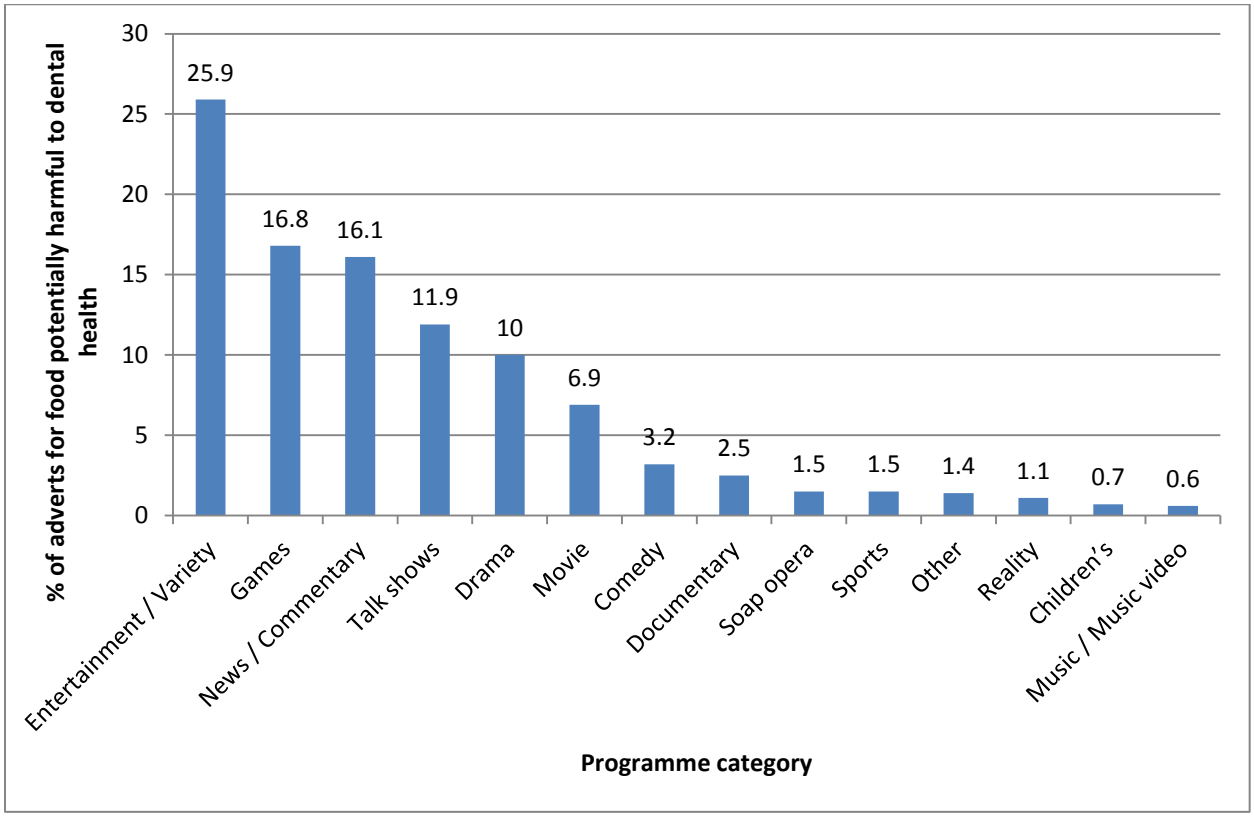


Table 8.13 and figure 8.16 show that there was a significant difference in the extent of advertising for foods potentially harmful to dental health shown in and around different programmes during peak and non-peak children's viewing times ($p < 0.001$). They illustrate the distribution of these adverts between children's viewing times within each programme category. Although food products potentially harmful to dental health were most commonly promoted in and around entertainment and game shows, they varied significantly in their distribution between peak and non-peak children's viewing times ($p < 0.001$). During peak time, the proportion of adverts for food potentially harmful to dental health was the highest in and

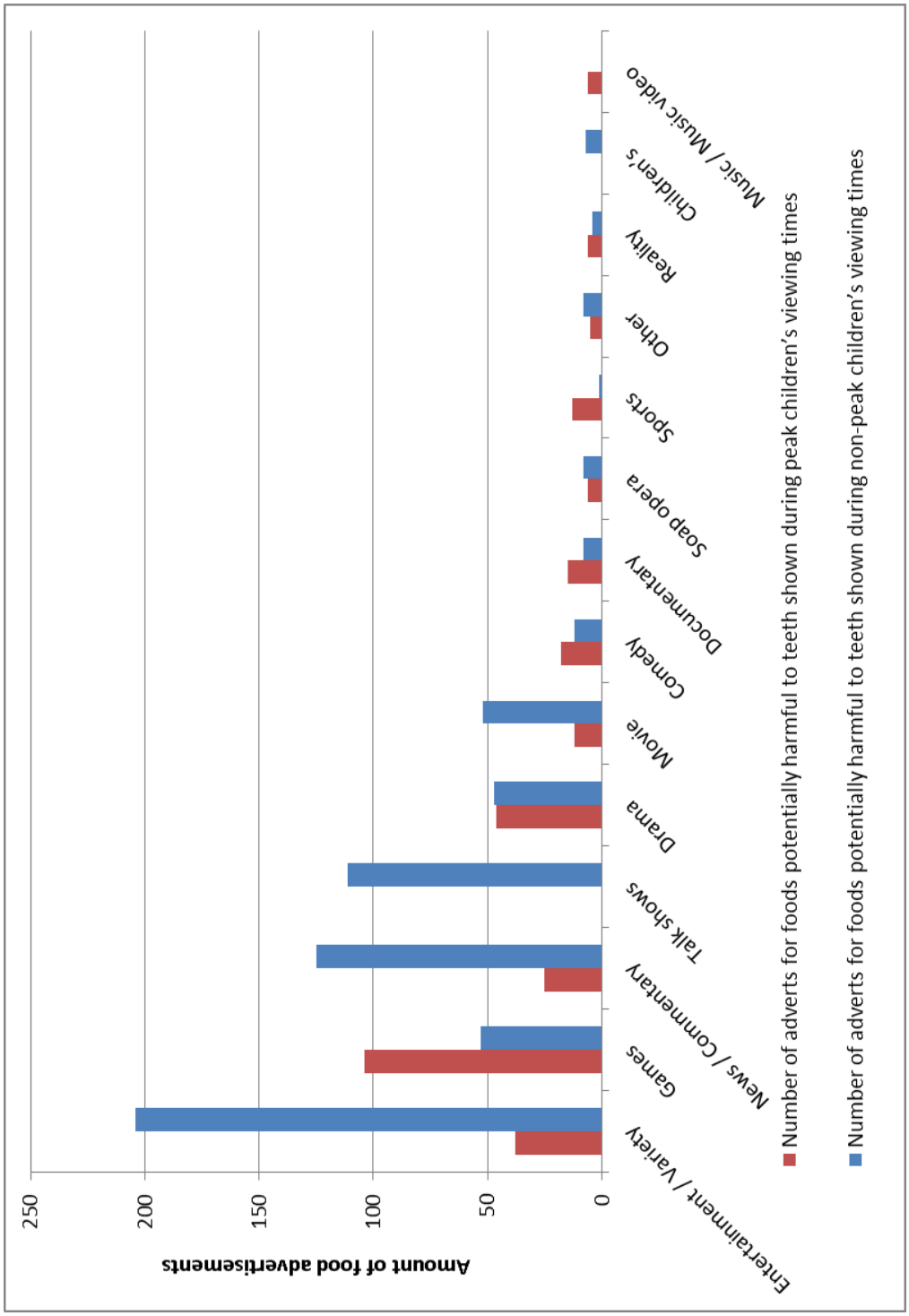
around game shows. On the other hand, the proportion of such adverts was the highest around entertainment programmes during non-peak children's viewing times.

Table 8.13: The extent of advertising for foods potentially harmful to dental health during peak and non-peak children's viewing times within each programme category

Programme category	Number of adverts for foods potentially harmful to teeth shown during peak children's viewing times	Number of adverts for foods potentially harmful to teeth shown during non-peak children's viewing times	Number of adverts for foods potentially harmful to teeth
Entertainment/ Variety	38 (15.7%)	204 (84.3%)	242 (25.90 %)
Games	104 (66.2%)	53 (33.8%)	157 (16.8 %)
News/ Commentary	25 (16.7%)	125 (83.3%)	150 (16.10 %)
Talk shows	0 (0%)	111 (100%)	111 (11.90 %)
Drama	46 (49.5%)	47 (50.5%)	93 (10.00 %)
Movie	12 (18.8%)	52 (81.3%)	64 (6.90 %)
Comedy	18 (60%)	12 (40%)	30 (3.20 %)
Documentary	15 (65.2%)	8 (34.8%)	23 (2.5 %)
Soap opera	6 (42.9%)	8 (57.1%)	14 (1.50 %)
Sports	13 (92.9%)	1 (7.1%)	14 (1.50 %)
Other	5 (38.5%)	8 (61.5%)	13 (1.40 %)

Reality	6 (60%)	4 (40%)	10 (1.10 %)
Children's	0 (0%)	7 (100%)	7 (0.70 %)
Music/ Music video	6 (100%)	0 (0%)	6 (0.60 %)
Total	294 (31.5%)	640 (68.5%)	934 (100 %)

Figure 8.16: The proportion of advertising for foods potentially harmful to dental health during peak and non-peak children's viewing times within each programme category



8.4.2 The extent of advertising for foods potentially harmful to dental health around children's programmes

The number of advertisements for foods potentially harmful to dental health (35%) in or around children's programmes was significantly lower than the number of advertisements for foods/ products potentially non-harmful to dental health (65 %)($p = 0.017$). Of all food adverts (20) shown in or around children's programmes, only seven were for foods potentially harmful to dental health. The odds of a food advertisement for food potentially harmful to dental health being shown in or around children's programmes were 0.34 (95% CI; 0.14 - 0.86).

8.5 Position of adverts for foods potentially harmful and non-harmful to dental health (during/between programmes)

Of the 1532 food adverts, 1238 (80.8 %), were shown during programmes. While the proportion of adverts for food potentially harmful to dental health shown during programmes (61.8%) was higher than for foods/ products potentially non-harmful to dental health (38.2%), this difference was not statistically significant ($p = 0.173$). A similar distribution of adverts for foods potentially harmful to dental health was found between the proportion of these adverts shown between (57.5%) and during (61.8%) programmes (Table 8.14).

Table 8.14: Percentage of adverts for foods potentially harmful and non-harmful to dental health shown at different viewing times (between/during programmes)

Food type	Adverts shown between programmes	Adverts shown during programmes	Total
Food potentially harmful to dental health	169 (57.5 %) (18.1 %)	765 (61.8 %) (81.9 %)	934
Food potentially non-harmful to dental health	125 (42.5 %) (20.9 %)	473 (38.2 %) (79.1 %)	598
Total	294 (19.2 %)	1238 (80.8 %)	1532

8.6 Primary target of adverts for foods potentially harmful and non-harmful to dental health

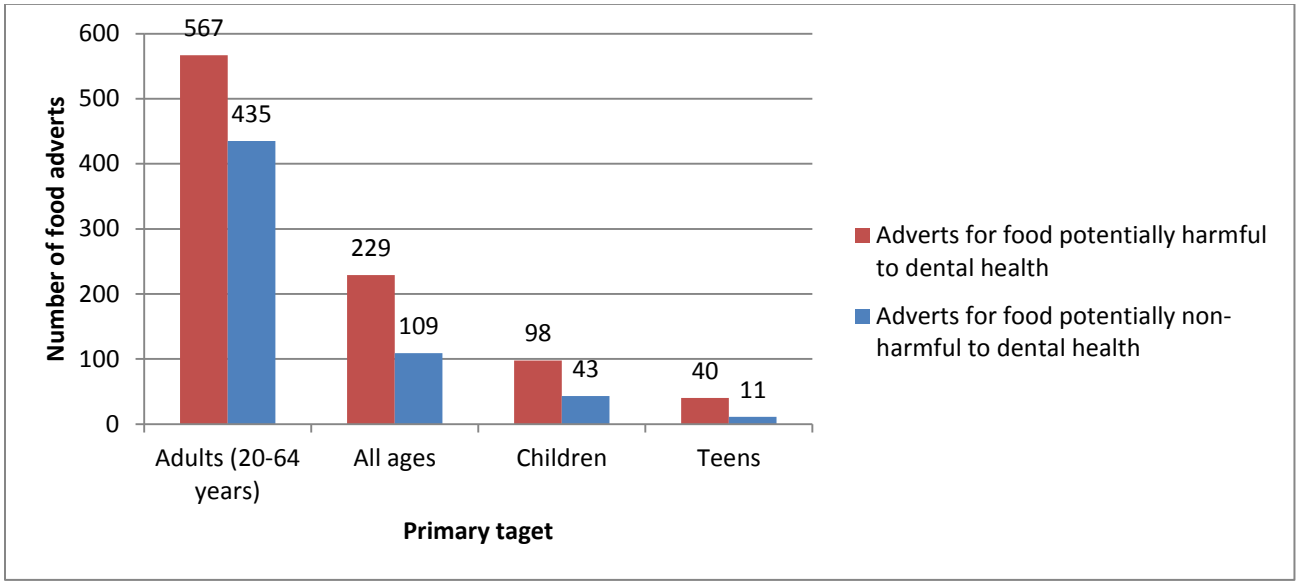
The proportion of adverts for foods potentially harmful and non-harmful to dental health showed extremely significant differences within and between each age group ($p = 0.000012$) (Table 8.15-figure 8.17). Of the 934 adverts for foods potentially harmful to dental health, almost two thirds (60.7 %) of those adverts targeted adults, and around a quarter (24.5 %) of them were aimed at all ages, but only 14.8 % of them were targeted at children and teens. On the other hand, the proportion of adverts for foods potentially harmful to dental health compared to the proportion of those for foods/ products potentially non-harmful to dental

health within each age group showed different results. The proportions of adverts for foods potentially harmful to dental health targeted at teens (78.4 %) and for children's (69.5 %) groups were higher than those for adverts aimed at all ages (67.8 %) and adult groups (56.6 %) when compared with the proportion of adverts for foods/ products potentially non-harmful to dental health within each group. In fact, the odds of a food advertisement being for food potentially harmful to dental health aimed at children and teens is 0.61 (95%CI; 0.45-0.82), while for those aimed at adults and all ages groups is 1.07 (95%CI; 1.03-1.20).

Table 8.15: Percentage of adverts for foods potentially harmful to dental health in each age group

Primary target	Adverts for foods potentially harmful to dental health	Adverts for foods potentially non-harmful to dental health	Total
Adults (20-64 years)	567 (56.6 %)	435 (43.4 %)	1002
All ages	229 (67.8 %)	109 (32.2 %)	338
Children	98 (69.5 %)	43 (30.5 %)	141
Teens	40 (78.4 %)	11 (21.6 %)	51
Total	934	598	1532

Figure 8.17: Number of adverts for foods potentially damaging to dental health in each age group



8.7 Direction to websites in adverts for foods potentially harmful and non-harmful and non-harmful to dental health

Table 8.16 shows the proportion of adverts for foods potentially harmful and non-harmful to dental health with and without a website promoted during the advertisement. The number of adverts for foods potentially harmful to dental health with a link to the related website boosted in the advert (273) was significantly higher (p = 0.002) than the number of adverts for foods/ products potentially non-harmful to dental health promoting their website addresses (220). The odds of a food advertisement being for food potentially harmful to dental health with a website promoted during the advertisement is 0.46 (95%CI; 0.37-0.57).

Table 8.16: Percentage of adverts for foods potentially damaging to dental health with and without a website promoted during the advertisement

Food type	Adverts with link to website	Adverts without link to website
Food potentially damaging to dental health	273 (29.2%)	661 (70.8%)
Food potentially non-damaging to dental health	220 (36.8%)	378 (63.2%)

8.8 Summary of the main findings:

- Food and drink were the second most heavily advertised products, accounting for 16.7 % of all ITV 1 adverts.
- Supermarkets promoting mostly non-core foods, fast foods, chocolate and confectionery, high fat, high sugar or high salt spreads were some of the most frequently advertised products.
- When food adverts were classified based on their effect on general health, non-core foods were the most commonly advertised products, whereas core foods were the least commonly advertised products.
- When food adverts were classified based on their effect on dental health almost two thirds of all food adverts were for foods potentially harmful to dental health (61%). Cariogenic foods dominated the advertisements for food potentially harmful to dental health, accounting for 96.6 % of these adverts.
- The proportion of adverts for cariogenic foods with high and very high sugar levels (> 9 g/100g or 100ml) accounted for 44.7% of all cariogenic food adverts, contributing to the majority of food advertisements in this category.
- Sticky foods formed the majority of food adverts for products containing a very high sugar level — almost 50% of the overall food advertisements in this group.
- Soft drinks were the most commonly advertised acidogenic foods/ drinks — 52.4% of all acidogenic food adverts.

- Out of the 1532 food adverts, only 99 adverts were for common foods/ drinks with possible anti-cariogenic and/ or anti-erosive effects, and of the 9151 adverts, only 109 adverts were for dental healthcare products.
- The extent of advertising for foods potentially harmful to dental health was generally higher than that of advertising for foods/ products potentially non-harmful to dental health across the year, with the exception of December.
- During peak children's viewing times, the extent of advertising for foods potentially harmful to dental health (65.9%) was significantly higher than the extent of advertising for foods/ products potentially non-harmful to dental health (34.1%).
- During the non-peak children's viewing hours, the number of adverts for food potentially harmful to dental health (640) was significantly higher than the number of adverts for foods/ products potentially non-harmful to dental health (446) promoted during the same period ($p = 0.011$).
- Although the number of adverts for foods potentially harmful to dental health was less than 1% around children's programmes, these adverts were shown more during other programmes watched by children and young people, accounting for more than one third (42.7 %) of all adverts for foods potentially harmful to dental health shown in or around entertainment programmes (25.9 %) and game shows (16.8 %).
- The proportion of adverts for foods potentially harmful to dental health was the highest in and around game shows during peak children's viewing times and during entertainment programmes in non-peak children's viewing times.

9.0 DISCUSSION

The results of this study showed that, on the main commercial channel in the UK in 2012, food was the second most commonly advertised product (after channel promotions) and almost two thirds of these food adverts depicted food items that are potentially detrimental to dental health. Cariogenic foods contributed to the majority of advertised products for foods potentially harmful to dental health. Of the cariogenic food adverts, 44.7% were for foods/ drinks containing a high and very high sugar level, with almost 50% of the latter being for sticky foods, which are considered the most cariogenic type of food rich in sugar. Of the acidogenic food adverts, soft drinks were the most frequently advertised products. It is disappointing to see that, despite good adherence to the regulations and restrictions on advertising of unhealthy foods on UK television watched by children, as stated by the Advertising Standards Authority, food markets are still targeting children via television by promoting a significantly high proportion of adverts for foods potentially harmful to dental health during children's peak viewing times and around programmes that attract children and young teens, such as entertainment programmes and game shows.

9.1. The extent of advertising for food and non-food products

Because the present study was conducted after the full implementation of the food advertising regulations, which involved the removal of all HFSS advertising from dedicated children's channels from January 2009, the effectiveness of the recent regulation can be evaluated by comparing the results of this study with the findings of previous ones. In the present study,

food and drink products represented the second highest commonly advertised product, accounting for 16.7% of all adverts. Similar results were found in some previous studies. In their sample, collected in 2006, Morgan et al. (2009) found that the percentage of food adverts represented 16.4% of all advertising time. A slightly higher proportion of food advertising was found in another study conducted by Kelly et al. (2010), in which foods comprised the second most commonly advertised products after channel promotions and represented 18% of all adverts in their 2007-2008 sample. Boyland et al. (2011) found that the food products in 2009 were the third most heavily advertised products, with 12.8% of all adverts, after channel promotions (19.6%) and toy advertisements (17.9%), on UK television channels popular among young people. However, when the study compared the proportion of food adverts shown on the ITV channel with the proportion of food adverts shown on all channels included in the study, it was found that the proportion on ITV was slightly higher, representing 16-17% of all adverts. These figures represented a significantly low percentage for food adverts compared to the percentage of food adverts found in a previous study conducted by Lewis and Hill (1998), in which 62.8% of all adverts were found to be for food products. The huge reduction in the amount of food advertising that can be seen in recent studies compared to past ones could be a result of the implementation of Ofcom regulations for food advertising in and around programmes with particular appeal to children. However, it could also reflect differences in study design, coding schemes, studied/ chosen channels and recorded hours and days as well as seasonal variation depending on the sampling frame.

Food and drink products represented the second most commonly advertised product category after the channel promotion adverts in the present study. Kelly et al. (2010) and Boyland et al. (2011) also found that channel promotions were the most commonly advertised items. Despite the fact that the number of channel promotions is the greatest out of all adverts types, it is difficult to compare this type of advert with food and drink adverts. While food and drink adverts are paid-for advertising, channel promotions are mostly free advertising promoting the same channel or other channels of the same network. Even with the difference in cost between these advert types, both constituted a very similar percentage of adverts in this study, with less than 1% difference between them.

Both the present study and Kelly et al. (2010) found that foods were the second most commonly advertised products; however, Boyland et al. (2011) found that foods were the third most commonly advertised products on 14 channels on UK television. In their study, the first and second most commonly advertised products were for channel promotions and toys, respectively. The reason why toys were the second most commonly advertised product may be because the study included family as well as dedicated children's channels, whereas the present study focused on a single commercial channel.

My findings were consistent with the results found in a cross-sectional study conducted in 2009 after the full implementation of the Ofcom regulations (Adams et al., 2012) which found that food adverts accounted for 14.6% of all television adverts. It can be seen that the aim of the Ofcom regulations to reduce children's exposure to unhealthy food advertisements was not

achieved according to analysis in the present study or in that conducted by Adams et al. (2012), because these adverts have not been eliminated, but rather have been shifted to other programmes and other viewing times during the day. However, the findings of Adams et al.'s study should be interpreted with caution, because their results only considered samples from one week, making their conclusions subject to seasonal variation in advertising patterns across the year. Furthermore, it was conducted soon after the implementation of the final phase of the food advertising regulations, and so it only evaluated the short term effects of the restriction but not the long term effects.

9.2 The extent and nature of advertising for foods and beverages classified based on their effect on general and dental health

Non-core foods were the most commonly advertised products, representing 43.9% of all food adverts, and were higher than other advertised products for miscellaneous (38.5%) and core foods (17.6%), respectively. Slight improvements were noticed when my findings were compared with the findings obtained in the previous conducted study by Boyland et al. (2011), which was carried out before the full implementation of the Ofcom regulations on food advertisements on UK television. The extent of advertised non-core food products was reduced by 7.1%; however, it remained the most commonly advertised product type. This change was associated with a very minimal increase in the extent of the advertising for core food products, which increased by only 0.5%, and also an increase in the extent of advertising for miscellaneous food products by 7.7%. In another study conducted by Kelly et al. (2010), it was

found that non-core foods represented almost two thirds of all food adverts (67%), which was considerably higher than the proportion found in the present study; however, the proportion of core foods (22%) was greater than in my study. Implementing regulations to reduce children's exposure to advertisements for HFSS foods in and around children's programmes does not mean that this would necessarily lead to an increase in the amount of advertising for healthy food products unless a requirement was stated in the regulations. This observation is clearly seen from the comparison between the findings in this study and those of others, where a reduction in the percentage of non-core products advertised on television was associated with an increase in the percentage of miscellaneous food products advertised.

In their cross-sectional study conducted in 2009, after the full implementation of the Ofcom regulations, Adams et al. (2012) found that, despite good adherence to the restrictions, almost two thirds of food adverts (60.4%) were advertising for HFSS foods . Compared with my findings, it represented a considerably higher percentage than that for the non-core products advertised in the present study. Nevertheless, this difference should be interpreted with caution because of the difference in food categories. However, it still shows that children are exposed to a high proportion of unhealthy food being advertised on television.

In the present study, the most commonly advertised food products were supermarkets promoting mostly non-core foods (12.5%), supermarkets promoting generic products (12.1%), fast foods (9%), chocolate and confectionery (7.8%), low fat dairy products (7.5%), supermarkets promoting mostly core food products (7.5%) and high fat/ high sugar/ high salt

spreads (7%). Similar results were found in a previously conducted study by Kelly et al. (2010) in which the most commonly advertised food products were fast food restaurant meals, followed by chocolate and confectionery, then low fat dairy products, high fat, high sugar or high salt spreads and sauces and full fat dairy products. Boyland et al. (2011) found that breakfast cereals with low levels of fibre, but high sugar content, chocolate/ confectionery and high fat/ sugar/ salt spreads were the most advertised food products. Lewis and Hill (1998) found that 60% of advertised foods were cereals and confectionery/ savoury snacks while Morgan et al. (2008) found that the most frequently advertised high sugar products were sugared cereals, followed by sweetened dairy products and confectionery. Rodd and Patel (2005) found that breakfast cereals with added sugar, confectionary and non-carbonated soft drinks were the most heavily advertised products of all advertised food products with high sugar and/ or acid content.

9.3 Differences by children's viewing times

In the present study, the proportion of food advertising for non-core, core and miscellaneous food products was significantly different between peak and non-peak children's viewing times. Non-core food products were the most commonly advertised food products during children's peak viewing times. Kelly et al. (2010) found that there was an increase in advertising of non-core foods during peak children's viewing times in the UK. Boyland et al. (2011) found that the overall extent of food advertising was significantly higher during peak children's viewing times compared to non-peak children's viewing times. However, the difference between the

proportion of advertising of different types of food (core, non-core and miscellaneous) did not show significant differences between viewing times. Differences existing between the studies should be interpreted with caution, taking into consideration the differences in the number and types of channels included in each study.

During peak children's viewing times, the extent of advertising for food potentially harmful to dental health (65.9%) was significantly higher than the extent of advertising for foods/ products potentially non-harmful to dental health (34.1%). It is a worry that the extent of advertising for food potentially detrimental to dental health accounted for almost two thirds of the food adverts during peak children's viewing times, particularly when taking into consideration that children and adolescents spend most of their television viewing time outside children's programmes (Ofcom, 2008).

After implementing stricter regulations in 2009, we would expect to see some improvements and a further reduction in children's exposure to HFSS food advertising. However, that has not been achieved because the regulations did not take into consideration children's viewing times or the number of children watching programmes other than children's programmes (e.g. game shows) on family channels. Although the recent regulations attempted to reduce children's exposure to HFSS foods by banning adverts for those types of food on dedicated children's channels and in and around programmes of particular appeal to children, these programmes were determined by the percentage of children in the audience rather than the actual number of children watching television during that period of time. Therefore, the regulations are not sufficiently effective in reducing children's exposure to HFSS foods during peak children's

viewing times because they do not take into account the viewing periods when there are still a considerable number of children watching television.

9.4 Seasonal variations

It was found that the extent of advertising patterns for both foods potentially harmful and non-harmful to dental health varied significantly across the year. The result of the present study was consistent with Boyland et al. (2011) who found significant differences in the proportion of advertising for core, non-core and miscellaneous foods across the year. It is interesting to see that the extent of variation in the advertising patterns for foods that are potentially harmful to dental health was very similar to the extent of variation of advertising patterns for non-core foods presented in the study by Boyland et al. (2011), as illustrated in figures 9.1 and 9.2.

It is of a concern that a significant increase in advertising of unhealthy foods was seen around Easter time in both the present study and that of Boyland et al. (2011). However, both studies showed a drop in the percentage of advertising for unhealthy foods during the summer holiday, which could be considered a positive finding that could help in reducing children's exposure to these types of food during school holiday periods. On the other hand, an increase in the number of adverts for foods/ products potentially non-harmful to dental health during December does not mean that there was a corresponding increase in the amount of advertising for healthy food, a finding that can be explained by the increase in supermarket adverts promoting such things as non-specified foods (e.g. different types of alcohol, which were given equal attention and promoted at the same time) during the Christmas period. This expectation is supported by the results found in Boyland et al. (2011), in which the percentage of adverts

promoting miscellaneous foods was significantly higher than that of adverts promoting non-core or core foods.

Figure 9.1: The variation in advertising patterns for foods potentially harmful and non-harmful to dental health in each month across the year:

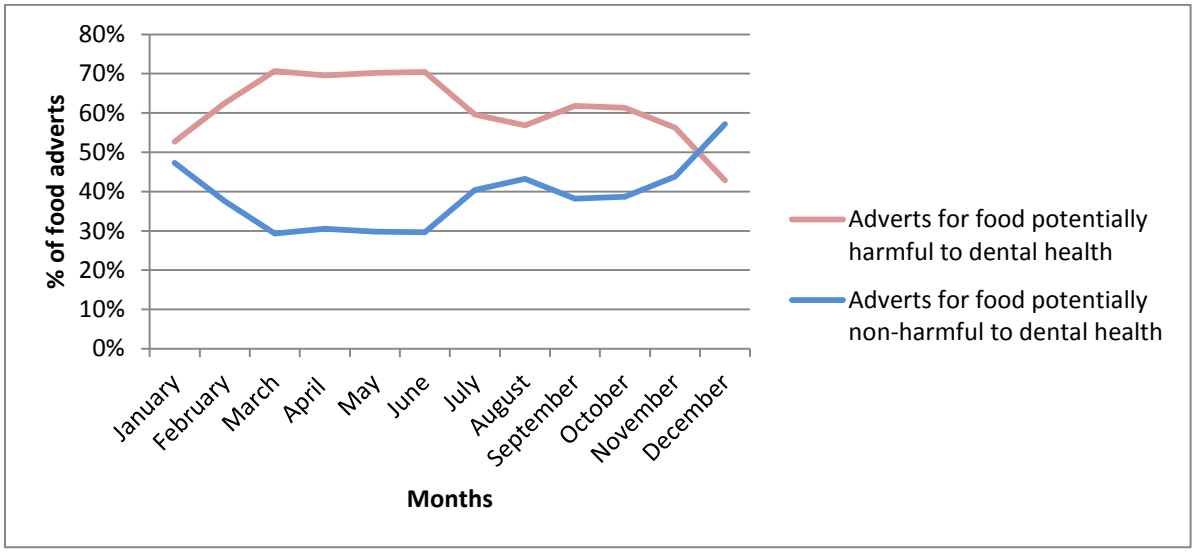
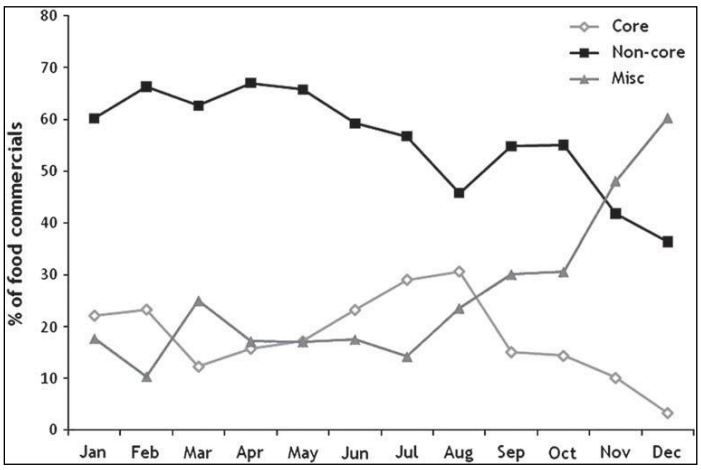


Figure 9.2: The variation in advertising patterns for core, non-core and miscellaneous foods in each month across the year (Boyland et al., 2011) **:**



9.5 Differences between programme categories

In spite of the fact that the percentage of adverts for food potentially detrimental to dental health was less than 1% in and around programmes aimed at children, children were still targeted by food marketing companies through the promotion of more than one third of foods potentially harmful to dental health (42.7%) in and around entertainment programmes (25.9 %) and game shows (16.8 %). Similar results were found in previous studies. Boyland et al. (2011) found that there was a significantly greater proportion of food advertisements in and around entertainment programmes (19.7%) as compared to children's programmes (4.5%). However, the distribution of the core, non-core and miscellaneous foods advertised around different programmes did not show a significant difference. Kelly et al. (2010) found that entertainment programmes were among the five programme categories with the highest proportion of food advertisements.

Unfortunately, children are still exposed to a high number of adverts promoting foods that are potentially harmful to dental health, due to the fact that regulations fail to take into consideration other types of programmes with general appeal which are popular, not only with adults, but also with children and young people (e.g. entertainment programmes and game shows). The limited restriction has led to a shift of those adverts to other programmes watched by children where the restrictions do not apply. It can be concluded that the aim of the 2009 Ofcom food advertisement regulations has not been achieved because they have not been effective enough in reducing children's exposure to those types of food adverts in and around

programmes of general appeal at a time when a considerable number of children are watching television.

9.6 Direction to websites in food adverts

A website address was promoted in 32.2% of all food adverts. This is slightly higher than the proportion of food adverts that promoted their website (30.8%) in the results found in Boyland et al. (2011). According to Gantz et al. (2007), directing people to the product's website is another way of promoting products and persuading people of the positive value of the promoted product.

10.0 RESEARCH IMPLICATIONS

This research throws light on the immediate need for a review of the existing regulations on television food advertising and making the necessary modifications to overcome the problem of having children exposed to a large number of advertisements for unhealthy food. A forceful step should be taken not only to reduce children's exposure to unhealthy food adverts, but also to create a new policy for health promotion that encourages the advertising of more healthy food products. Hopefully such a step would help in positively changing children's dietary choices and food consumption towards healthy food products. As a consequence, the prevalence of diseases and dental and general health problems where an unhealthy diet is considered to be one of the contributing factors would, hopefully, be reduced.

A modification to Ofcom's 2009 food advertising regulations should be made to help in achieving the aim of reducing children's exposure to unhealthy food products. It is clear that it is not enough simply to ban HFSS food from adverts in and around programmes aimed at children and on dedicated children's channels, because television viewing times and other channels should be taken into account too. Children are exposed to television food adverts promoted on family channels aimed at young adults and teens (e.g. games) at any time from 6:00 am until 10:00 pm. Therefore, the restriction should be further modified to ban unhealthy food adverts before 10:00 pm. The UK National Institute for Health and Clinical Excellence suggested considering using a time-based 'watershed' to reduce children's exposure to adverts promoting unhealthy food products (National Institute for Health and Clinical Excellence, 2010). The good adherence to the restriction on food advertising regulations that was seen in my

study and the previous study conducted by Adams et al. (2012) supports the effectiveness of implementing such a regulation.

Re-evaluation of the products included in the restrictions should also be considered, because there are dietary products other than HFSS foods that might still be detrimental to dental health and which do not contain the necessary nutrients, such as diet drinks.

Cairns et al. (2013) found that food advertising is considered a significant and independent determinant of children's food behaviours. Therefore, it is wise to use the power of the media to help in building a healthy public policy by promoting healthy food; this could prove a successful approach in the prevention of obesity and other health-related problems as well as dental caries and erosion. Efforts should be taken to establish good dietary choices in children and adolescents, by increasing their exposure to healthy food products and considering the use of celebrities and promotional offers and other food marketing techniques to promote healthy food. The emotional connection that some children may have to celebrities and licensed characters can be used to produce a positive influence on their dietary choices and consumption. Delivering positive health messages in promoting healthy food products could improve dietary choices and consumption. Showing logos that are easily recognisable by children in healthy food adverts, such as the 'health friendly' logo suggested by Cinar and Murtomaa (2009) for food labeling, could help in providing a clear picture to children of what is healthy to eat or drink for good general and dental health.

11.0 RESEARCH LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

This study focused only on a single terrestrial channel. Although it enabled us to evaluate the effectiveness of phase three of Ofcom's food advertising regulations, the findings should be interpreted with caution. The availability of the many different channels children watch nowadays and changes in their viewing habits regarding some children's dedicated channels should be taken into account when evaluating children's exposure to food advertisements. A future study that includes more channels would provide a comprehensive assessment and better reflection of the impact of the regulations on children's exposure to unhealthy food advertisements.

Programme sponsorships were not coded as advertisements. The reason for excluding them was their variable nature. However, this might result in underestimating the full extent of children's exposure to food adverts on television.

A rough overall idea regarding the effectiveness of the last phase of Ofcom's food advertising regulations has been drawn by making a comparison and contrast between my findings and the results found in previous studies. Because of the variations existing between the present and previous studies in terms of study design, sample size, type and number of channels included in the study, types of food coded, recorded days and viewing times, recorded months and the year studied, data should be interpreted with caution.

Further study is needed to evaluate the effectiveness of Ofcom's 2009 regulations in prohibiting the use of promotional characters (licensed characters and celebrities), promotional offers and

health claims in HFSS food advertising to children, and to study the persuasive marketing techniques used in unhealthy food advertisements.

12.0 CONCLUSION

The current study provides a retrospective insight into the extent and nature of food advertising to children on UK television in 2012. It was concluded that the majority of food advertisements were for cariogenic foods, and the great bulk of these advertisements were for foods with high and very high sugar levels (> 9 g/100g or 100ml). The main area of concern is that children are exposed to a considerably high proportion of advertisements for foods potentially detrimental to dental health during peak children's viewing hours and also around other programmes watched by children. This suggests the need to apply a stricter restriction to meet the aim of the Ofcom regulations in significantly reducing children's exposure to unhealthy food advertisements.

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14.0 APPENDICES

<u>Appendix one:</u> Overview of the attribute levels used for the traffic light signposting scheme

(Food Standards Agency; Hieke and Wilczynski, 2012)

	Low Level	Medium Level	High Level
Fat (g/100 g or 100 ml)	2.8	9.6	32.1
Saturated fat (g/100 g or 100 ml)	0.9	2.5	8.5
Sugar (g/100 g or 100 ml)	1.8	9.0	32.6
Sodium (g/100 g or 100 ml)	0.1	1.3	2.7
Calories kJ/100 g or 100 ml kcal/100 g or 100 ml	 109 26	 686 164	 1602 383

Appendix two: Coding scheme for television food adverts

COLUMN A: Channel — Channel name

COLUMN B: Date — Format DD/MM/YY

COLUMN C: Day — Day of the week

COLUMN D: Programme name

Programme in which the advertisement is shown (if advert is between programmes name the preceding programme)

COLUMN E: Programme category

Code as below:

1 = Comedy

2 = Drama

3 = Movie

4 = Soap opera

5 = Music/music video

6 = News/commentary

7 = Talk shows

8 = Reality

9 = Sports

10 = Entertainment/variety

11 = Documentary

12 = Game

13 = Children's

14 = Infomercial

15 = Other

COLUMN F: Starting time

Starting time of the programme in 24hr clock format (e.g. 13:50 not 1.50pm. Must be separated with a colon).

COLUMN G: Time slot

6:00 = 1

6:30 = 2

7:00 = 3

7:30 = 4

8:00 = 5

8:30 = 6

9:00 = 7

9:30 = 8

10:00 = 9

10:30 = 10

11:00 = 11

11:30 = 12

12:00 = 13

12:30 = 14

13:00 = 15

13:30 = 16

14:00 = 17

14:30 = 18

15:00 = 19

15:30 = 20

16:00 = 21

16:30 = 22

17:00 = 23

17:30 = 24

18:00 = 25

18:30 = 26

19:00 = 27

19:30 = 28

20:00 = 29

20:30 = 30

21:00 = 31

21:30 = 32

COLUMN H: Peak or non-peak children's viewing time

Peak = 1

Weekdays = 17:30 – 22:00

Weekend = 19:00 – 21:00

Non-peak = 0

All other times

COLUMN I: High or non-high children's viewing time

High = 1

Weekdays = 07:30 – 09:30

= 15:00 – 22:30

Weekend = 08:00 – 22.30

Non-high

All other times

COLUMN J: Between or during programme

During programme = 1

Between programmes = 0

COLUMN K: Advert product type

1 = Food and drink

2 = Clothes/shoes

3 = Education

4 = Entertainment (including music, video, films, entertainment parks)

5 = Financial (including building societies, banks, insurance, pensions)

6 = Household cleaners/detergents (including washing up liquid, washing powders, cleaning fluids)

7 = Household equipment (including electrical appliances)

8 = Motoring (including cars and petrol)

9 = Pet products (including pet food)

10 = Pharmaceutical (including medications, vitamin pills, breath fresheners)

11 = Public information announcements/community service announcements (general)

12 = Public information announcements (sponsored by food companies)

13 = Publishing (including magazines, books, newspapers. Includes recipe books and cooking magazines)

14 = Retailing and mail order (including catalogues, other than supermarkets)

15 =Toiletries (including soap, hair shampoo, cosmetics, nappies, sanitary protection)

16 = Toys

17 = Travel/transport/holidays

18 = Utilities (including telephone, gas, electricity)

19 = Channel promotions (including promotions for the channel, other programs)

20 = Other

The following additional details of all *FOOD* advertisements are to be coded:

COLUMN M: Food product brand name

Manufacturer's name and brand name of product (e.g. McDonald's Big Mac or Cadbury's Fruit and Nut Chocolate).

COLUMN N: Detailed description of food product

The description of the product should be thorough. The product needs to be identifiable for the purposes of collecting nutrition information. Include flavour or brand variant (E.g. "chocolate coated, cream-filled biscuit" rather than just "biscuit").

COLUMN O: Food code

Food product categorised as one of 28 food categories shown below.

If more than one food product is shown in an advertisement, select the one that is the most dominant. If equal attention is given to different products, select the product that is shown first.

<u>Core and healthy food categories</u>

1 Breads (include high fibre, low fat crackers), rice, pasta and noodles

2 Low sugar and high fibre breakfast cereals (<20g/100g sugar *and* >5g/100g dietary fibre)

3 Fruits and fruit products without added sugar

4 Vegetables and vegetable products without added sugar

5 Low fat/reduced fat milk, yoghurt, custard (<3g/100g fat) and cheese (<15g/100g fat; includes 50% reduced fat cheddar, ricotta and cottage) and their alternatives (e.g. soy) (including probiotic drinks)

6 Meat and meat alternatives (not crumbed or battered) (includes fish, legumes, eggs and nuts and nut products, including peanut butter and excluding sugar coated or salted nuts)

7 Core foods combined (including frozen meals (<10g/serve fat), soups (<2g/100g fat, excludes dehydrated), sandwiches, mixed salads and low fat savoury sauces (<10g/100g fat; includes pasta simmer sauces)

8 Baby foods (excluding milk formulae)

9 Bottled water (including mineral and soda water)

Non-core and unhealthy food categories

10 High sugar and/or low fibre breakfast cereals (>20g/100g *or* <5g/100g dietary fibre)

11 Crumbed or battered meat and meat alternatives (e.g. fish fingers) and high fat frozen meals (>10g/serve fat)

12 Cakes, muffins, sweet biscuits, high fat savoury biscuits, pies and pastries

13 Snack foods, including chips, savoury crisps, extruded snacks, popcorn, snack bars, muesli bars, sugar sweetened fruit and vegetable products (such as jelly fruit cups, fruit straps) and sugar coated nuts.

14 Fruit juice and fruit drinks

15 Frozen/fried potato products (excluding packet crisps)

16 Full cream milk, yoghurt, custard, dairy desserts (>3g/100g fat) and cheese (25% reduced fat and full fat varieties, and high salt cheese, including haloumi and feta) and their alternatives

17 Ice cream and iced confection

18 Chocolate and confectionery (including regular and sugar-free chewing gum and sugar)

19 Fast food restaurants/meals (include general pizza, burgers, and 'healthy' alternatives from fast food restaurants)

20 High fat/sugar/salt spreads (includes yeast extracts, excludes peanut butter), oils, high fat savoury sauces (>10g/100 fat), meal helpers (including stocks, tomato paste) and soups (>2g/100g fat tinned and all dehydrated)

21 Sugar sweetened drinks including soft drinks, cordials, electrolyte drinks and flavour additions e.g. Milo).

22 Alcohol

Miscellaneous

23 Vitamin and mineral supplements

24 Tea and coffee

25 Supermarkets – advertising mostly non-core foods

26 Supermarkets – advertising mostly core foods

27 Supermarkets – non-specified (generic supermarket ads or not clearly for core or non-core)

28 Baby and toddler milk formulae

29 Home food delivery services

(Note: Many fast food restaurants sell 'healthier' products. These items should still be classified as unhealthy, as it is essentially the brand name that they are promoting, not the product. Consumers continue to purchase unhealthy foods from these venues, and the provision of healthy alternatives merely acts to give the brand a positive image.)

COLUMN P: Premium offers

Assess the use of premium offers (including giveaways, competitions, contests, vouchers and rebates) to promote foods.

Food ads with premium offers = 1

Without = O

COLUMN Q: Primary persuasive appeal

1 Quantity

2 Convenience

3 Taste

4 Health/nutrition

5 Energy

6 Price

7 Unique/new

8 Fun

9 General superiority

10 Peer status/sex appeal

11 Premium or contest

12 Weight loss/diet

13 Offers choices/options

14 Enjoyment/satisfaction

15 Product introduction

16 Corporate information

17 Other

COLUMN R: Physical activity depicted

Characters (real or animated) engaged in purposeful physical activity beyond casual walking or simply moving about in a reasonably prominent way, not in background or a quick glimpse.

Physical activity depicted = 1

None depicted = 0

COLUMN S: Health claims

Verbal or textual. Where more than one claim is made, use main claim.

If more than one main claim, use first mentioned health claim.

1 Low fat/fat free

2 Sugar free

3 No added sugar/less sugar

4 Low calorie/light

5 Low carbohydrate

6 Organic

7 Natural ingredients/all natural/no preservatives/nothing artificial

8 Provides essential nutrients (inc. protein, calcium, potassium, vitamins, antioxidants)

9 Whole grain/whole wheat

10 Fibre or bran

11 Heart healthy

12 Low cholesterol

13 Diet

14 Baked

15 Five a day

COLUMN T: Disclaimers

1 Part of a balanced/complete/nutritious breakfast or meal

2 Part of a balanced/healthy diet

3 Not a substitute for a real meal

4 Enjoy in moderation

5 Other

COLUMN U: Celebrities

1 Entertainment celebrity

2 Sportsperson

3 Business leader

4 Politician

5 Other

COLUMN V: Brand equity/licensed character

0 None featured

1 Brand equity character: Created by manufacturers, only associated with that brand and nowhere else (e.g. Coco the Monkey, Ronald McDonald).

2 Licensed character: Character in its own right, used to promote this product (e.g. Shrek).

COLUMN W: Primary target

Intended target audience (determine using age of actors, network and nature of persuasive appeal).

1 Children

2 Teens

3 Adults (20-64 yrs)

4 Older adults (65+yrs)

5 All ages

COLUMN X: Direction to website

Mentions the company website or flashed the website on the screen = 1

None = 0

<u>Appendix three</u>: Modified coding scheme for television food adverts

COLUMN A: Channel — Channel name

COLUMN B: Date — Format DD/MM/YY

COLUMN C: Day — Day of the week

COLUMN D: Programme name

Programme in which the advertisement is shown (if advert is between programmes name the preceding programme)

COLUMN E: Programme category

Code as below:

1 = Comedy

2 = Drama

3 = Movie

4 = Soap opera

5 = Music/music video

6 = News/commentary

7 = Talk shows

8 = Reality

9 = Sports

10 = Entertainment/variety

11 = Documentary

12 = Game

13 = Children's

14 = Infomercial

15 = Other

COLUMN F: Starting time

Starting time of the programme in 24hr clock format (e.g. 13:50 not 1.50pm. Must be separated with a colon).

COLUMN G: Time slot

6:00 = 1

6:30 = 2

7:00 = 3

7:30 = 4

8:00 = 5

8:30 = 6

9:00 = 7

9:30 = 8

10:00 = 9

10:30 = 10

11:00 = 11

11:30 = 12

12:00 = 13

12:30 = 14

13:00 = 15

13:30 = 16

14:00 = 17

14:30 = 18

15:00 = 19

15:30 = 20

16:00 = 21

16:30 = 22

17:00 = 23

17:30 = 24

18:00 = 25

18:30 = 26

19:00 = 27

19:30 = 28

20:00 = 29

20:30 = 30

21:00 = 31

21:30 = 32

COLUMN H: Peak or non-peak children's viewing time

Peak = 1

Weekdays = 17:30 – 22:00

Weekend = 19:00 – 21:00

Non-peak = 0

All other times

COLUMN I: Between or during programme

During programme = 1

Between programmes = 0

COLUMN J: Advert product type

1 = Food and drink

2 = Clothes/shoes

3 = Education

4 = Entertainment (including music, video, films, entertainment parks)

5 = Financial (including building societies, banks, insurance, pensions)

6 = Household cleaners/detergents (including washing up liquid, washing powders, cleaning fluids)

7 = Household equipment (including electrical appliances)

8 = Motoring (including cars and petrol)

9 = Pet products (including pet food)

10 = Pharmaceutical (including medications, vitamin pills, breath fresheners)

11 = Public information announcements/community service announcements (general)

12 = Public information announcements (sponsored by food companies)

13 = Publishing (including magazines, books, newspapers. Includes recipe books and cooking magazines)

14 = Retailing and mail order (including catalogues, other than supermarkets)

15 =Toiletries (including soap, hair shampoo, cosmetics, nappies, sanitary protection)

16 = Toys

17 = Travel/transport/holidays

18 = Utilities (including telephone, gas, electricity)

19 = Channel promotions (including promotions for the channel, other programs)

20 = Other

21= dental health care products

The following additional details on all *FOOD* advertisements are to be coded:

COLUMN K: Food product brand name

Manufacturer's name and brand name of product (e.g. McDonald's Big Mac or Cadbury's Fruit and Nut Chocolate).

COLUMN L: Detailed description of food product

The description of the product should be thorough. The product needs to be identifiable for the purposes of collecting nutrition information. Include flavour or brand variant (E.g. “chocolate coated, cream-filled biscuit” rather than just “biscuit”).

COLUMN M: Food code

If more than one food product is shown in an advertisement, select the one that is the most dominant. If equal attention is given to different products, select the product that is shown first.

Core and healthy food categories

1 Breads (include high fibre, low fat crackers), rice, pasta and noodles

2 Low sugar and high fibre breakfast cereals (<20g/100g sugar *and* >5g/100g dietary fibre)

3 Fruits and fruit products without added sugar

4 Vegetables and vegetable products without added sugar

5 Low fat/reduced fat milk, yoghurt, custard (<3g/100g fat) and cheese (<15g/100g fat; includes 50% reduced fat cheddar, ricotta and cottage) and their alternatives (E.g. soy) (including probiotic drinks)

6 Meat and meat alternatives (not crumbed or battered) (includes fish, legumes, eggs and nuts and nut products, including peanut butter and excluding sugar coated or salted nuts)

7 Core foods combined (including frozen meals (<10g/serve fat), soups (<2g/100g fat, excludes dehydrated), sandwiches, mixed salads and low fat savoury sauces (<10g/100g fat; includes pasta simmer sauces)

8 Baby foods (excluding milk formulae)

9 Bottled water (including mineral and soda water)

Non-core and unhealthy food categories

10 High sugar and/or low fibre breakfast cereals (>20g/100g *or* <5g/100g dietary fibre)

11 Crumbed or battered meat and meat alternatives (e.g. fish fingers) and high fat frozen meals (>10g/serve fat)

12 Cakes, muffins, sweet biscuits, high fat savoury biscuits, pies and pastries

13 Snack foods, including chips, savoury crisps, extruded snacks, popcorn, snack bars, muesli bars, sugar sweetened fruit and vegetable products (such as jelly fruit cups, fruit straps) and sugar coated nuts.

14 Fruit juice and fruit drinks

15 Frozen/fried potato products (excluding packet crisps)

16 Full cream milk, yoghurt, custard, dairy desserts (>3g/100g fat) and cheese (25% reduced fat and full fat varieties, and high salt cheese, including haloumi and feta) and their alternatives

17 Ice cream and iced confection

18 Chocolate and confectionery (including regular and sugar-free chewing gum and sugar)

19 Fast food restaurants/meals (include general pizza, burgers, and 'healthy' alternatives from fast food restaurants)

20 High fat/sugar/salt spreads (includes yeast extracts, excludes peanut butter), oils, high fat savoury sauces (>10g/100 fat), meal helpers (including stocks, tomato paste) and soups (>2g/100g fat tinned and all dehydrated)

21 Sugar sweetened drinks including soft drinks, cordials, electrolyte drinks and flavour additions e.g. Milo).

22 Alcohol

Miscellaneous

23 Vitamin and mineral supplements and sweeteners

24 Tea and coffee

25 Supermarkets – advertising mostly non-core foods

26 Supermarkets – advertising mostly core foods

27 Supermarkets – non-specified (generic supermarket ads or not clearly for core or non-core)

28 Baby and toddler milk formulae

29 Home food delivery services

(Note: Many fast food restaurants sell 'healthier' products. These items should still be classified as unhealthy, as it is essentially the brand name that they are promoting, not the product. Consumers continue to purchase unhealthy foods from these venues, and the provision of healthy alternatives merely acts to give the brand a positive image.)

COLUMN N: Primary target

Intended target audience (determine using age of actors, network and nature of persuasive appeal).

1 = Children

2 = Teens

3 = Adults (20-64 years)

4 = Older adults (65+yrs)

5 = All ages

COLUMN O: Direction to website

1 = Mentions the company website or flashed the website on the screen

0 = None

COLUMN P: Cariogenic food

0 = low level of sugar containing diet (0.1 - 1.8 g/100 g or 100 ml)

1 = medium level of sugar containing diet (1.9-9.0 g/100 g or 100 ml)

2 = high level of sugar containing diet (9.1-32.5 g/100g or 100ml)

3 = very high sugar containing diet (≥32.6 g/100 g or 100 ml) – liquid

4 = very high sugar containing diet (≥32.6 g/100 g or 100 ml) - slowly dissolving foods

5 = very high sugar containing diet (≥32.6 g/100 g or 100 ml - solid foods

6 = very high sugar containing diet (≥32.6 g/100 g or 100 ml - sticky foods

7 = Non-specified foods

8 = Supermarkets – non-food products

9 = Supermarkets – dental healthcare products

10 = zero

COLUMN Q: Common acidogenic food

0 = None erosive diet

1= Soft drinks — carbonated and diluted squashes (including the 'diet' varieties and sports drinks)

2 = Fresh fruit juices and fruit juice drinks

3 = Fruit and acidic sweets (e.g. acidic fruit drops)

4 = Non-specified foods

5 = Supermarkets – non-food products

6 = Supermarkets – dental healthcare products

COLUMN R: Common food with possible anticariogenic and/or anti erosive effect

0 = None

1= milk

2 = cheese

3 = peanuts

4 = sugar-free chewing gum

5 = xylitol sweeteners, gum

6 = tea (unsweetened)

7 = Non-specified foods

8 = Supermarkets – non-food products

9 = Supermarkets – dental healthcare products